Spreckels SUGAR BEET Bulletin

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AGRICULTURAL DEPARTMENT—SPRECKELS SUGAR COMPANY

Addresses and Telephone Numbers

NAME	TITLE	ADDRESS	TELEPHONE
		SAN FRANCISCO	
Guy D. Manuel	*Vice President and General Agriculturist*	*2 Pine Street*	*Douglas 2-5600*
		SALINAS DISTRICT	
George P. Wright	*District Manager*	SPRECKELS	*Salinas 7321*
Ralph S. Lambdin	*Asst. District Manager*	"	" "
William H. Paulsen	*Agricultural Superintendent*	"	" "
James E. Gardiner	*Field Superintendent*	"	" "
Grover C. McCandless	*Field Superintendent*	"	" "
Harvey W. Parker	*Field Superintendent*	"	" "
Harold H. Voth	*Field Superintendent*	"	" "
T. F. Ryan	*Asst. Field Superintendent*	"	" "
Henry Sevier	*Superintendent of Company Ranches*	"	" "
Walter L. Gerow	*District Engineer*	"	" "
Dr. R. T. Johnson	*Plant Breeder*	"	" "
Robert E. Flores	*Assistant to Plant Breeder*	"	" "
J. Byron Larsen	*Asst. Agricultural Superintendent*	KING CITY	*King City 602M*
		SACRAMENTO AND SOUTH SAN JOAQUIN DISTRICTS	
Hugh F. Melvin	*District Manager*	SACRAMENTO *600 California Fruit Building*	*GI lbert 3-2021*
Harry J. Venning, Jr.	*Asst. District Manager*	" " " "	" "
John M. Lear	*Agricultural Superintendent*	" " " "	" "
P. T. Rezner	*Field Superintendent*	" " " "	" "
William A. Frank	*Field Superintendent*	" " " "	" "
William F. Ehrhardt	*Asst. Field Superintendent*	" " " "	" "
John F. McDougall	*Asst. Field Superintendent*	" " " "	" "
Austin A. Armer	*Agricultural Engineer*	" " " "	" "
Julian P. Williams	*District Engineer*	*2811 Fifth Street*	" *2-0449*
John O. Nielsen	*Asst. District Engineer*	" " " "	" "
W. H. Buckingham	*Agricultural Superintendent*	WOODLAND	*Woodland 2-2816*
S. S. Anderson	*Field Superintendent*	"	" "
William Duckworth	*Field Superintendent*	"	" "
John Kendrick	*Field Superintendent*	"	" "
W. B. Marcum	*Field Superintendent*	"	" "
Richard L. Pedder	*Field Superintendent*	"	" "
John W. Bryan	*Field Superintendent*	WALNUT GROVE *P. O. Box 35*	*Walnut Grove 3371*
Dan Dieter	*Field Superintendent*	LODI *720 Loma Drive*	*Lodi 8-0594*
R. Bruce Duncan	*Field Superintendent*	MANTECA	*Manteca 42*
N. K. Groefsema	*Field Superintendent*	LOS BANOS	*Los Banos 2491*
"	"	BAKERSFIELD *431 Kentucky Street*	*Bakersfield 4-4904*

SPRECKELS SUGAR BEET BULLETIN

THESE BEETS WERE THINNED MECHANICALLY

PLANTING

THINNING

CULTIVATING

HARVESTING

can be planned as a coordinated program of machine operations. See page 2.

Vol. 16 JANUARY - FEBRUARY, 1952 No. 1

PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

ELEMENTS OF SPRING MECHANIZATION

By AUSTIN ARMER
Agricultural Engineer, Spreckels Sugar Company

THE SUCCESS of spring mechanization in the Rocky Mountain and Eastern States has spurred the interest of California growers. Many of them will adopt the practice this season. It would therefore seem timely to discuss the general subject of spring mechanism with emphasis on the interdependence of planting, thinning and cultivation.

PLANTING FOR MECHANICAL THINNING

Mechanical thinning can be successful only when a uniform stand of beets emerging from soil in good tilth is available. That means that the decision to employ mechanical thinning should be made before the crop is planted.

The 1952 planting season has been delayed by wet weather. Much of the California acreage will be planted during the months of March and April. Because of this late planting, irrigation for emergence will be necessary in most cases—and highly desirable whenever mechanical thinning is contemplated. Even though there is some prospect of emergence from residual soil moisture or subsequent rains, irrigation for emergence is almost essential if a uniform stand is to be achieved. *Remember*—uniformity of stand is the first essential for success.

The second requirement for successful mechanical thinning is a seed bed which is level, free from large clods, and without crust at thinning time. This is a pretty difficult combination to accomplish, especially on some of our heavy soils. Many Mountain States growers have been successful in using rotary tillage in order to provide a clod-free seedbed, and this practice has been used with outstanding success by a limited number of California growers. Tools which have been successfully used for breaking up large clods in the seed beds include the Roto Tiller, the Cultro Rotary Cultivator and the Byhoe.

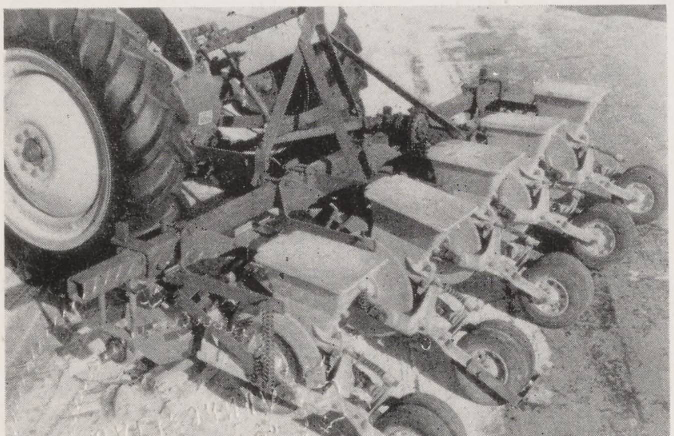

Photo courtesy Harbison-Payne, Inc. 2

THE MILTON precision planter unit has been redesigned for greater accuracy and longer life. The units shown above are mounted behind a Cultro rotary cultivator, which assures a well pulverized seed bed.

Care must be exercised to prevent milling the soil too fine, since this will invite the formation of crust. There is little danger with any of the above mentioned tools in milling the soil too fine, provided that the speed of rotation is kept within the limits set by the manufacturers.

At the present stage of planter development, the term "precision" is entirely relative. Whereas it is certainly desirable to use one of the so-called precision planters in anticipation of mechanical thinning, the grower must not expect a precision stand after emergence. There are so many factors beyond the control of planting mechanism which determine the location of seedlings that it is unfair to expect any planter to be completely responsible for the emergence of seedlings of identical size on identical spacings. In fact, a planter can do no more than place seeds at a fairly uniform depth and at fairly uniform intervals. The achievement of a uniform stand depends on the ability of the seed bed to offer the ideal environment required for germination of every seed unit. Monogerm seed will be available at some future date, but so long as processed multigerm seed is used, there are bound to be quite a few double plants.

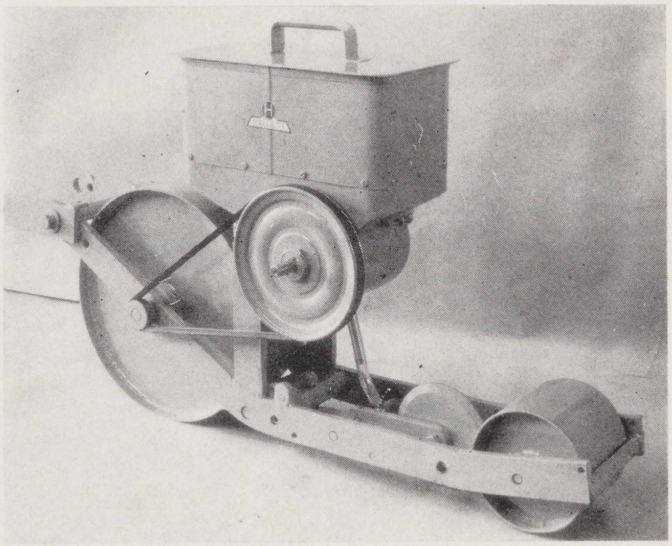

Photo courtesy Hallett Mfg. Co. 3

HALLETT MANUFACTURING COMPANY, Inglewood, California, has started production of this precision planter unit. Individual units are ground powered, and can be mounted on a sled or tractor toolbar.

MECHANICAL THINNING

When a skilled field laborer performs a thinning job, he accomplishes three important functions. These are:

1. Chopping out gaps in the row to establish plant spacing.
2. Singling the remaining blocks.
3. Removing in-the-row weeds.

To date there is no practical machine which duplicates these three operations. But there are a number of machines which reduce the original stand of both beets and weeds. When these machines are properly adjusted to suit any particular field condition, they

will leave a stand sufficiently thin and sufficiently free of weeds so that a touch-up job with a long handled hoe will leave a seedling stand capable of yielding the same tonnage and sugar content as could be accomplished by conventional hand thinning.

Of the many machines which have been offered for mechanical stand reduction, the type which has met with the greatest success in the Mountain and Eastern States is the positively powered rotary cutter type exemplified by the Dixie, Eversman and Silver machines.

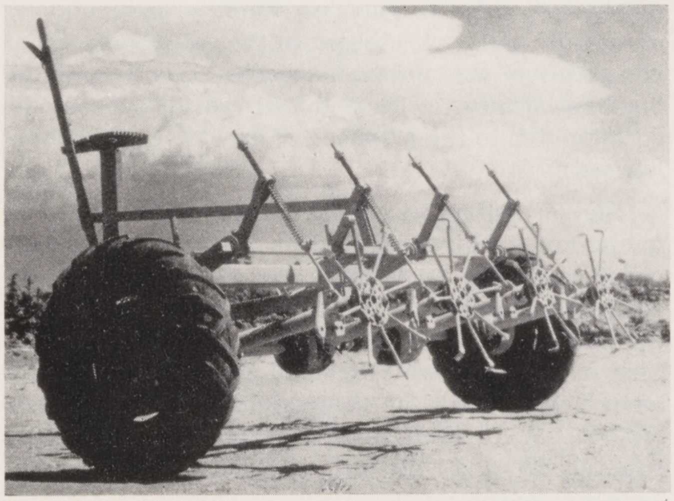

Photo by James Fischer 4

THE SILVER THINNER represents a type of stand reducing machine which has made Spring mechanization possible in the Mountain and Eastern States.

A limited number of 4-row Silver Thinning Machines are available for rental to Spreckels growers. Growers who decide to acquire their own thinning machines should consult their local implement dealers.

The system of mechanical stand reduction which has succeeded in the Mountain and Eastern States is a "Twice-Over System." In this system, the first operation consists in chopping out gaps in the seedling row, using a 1½ inch or 2 inch blade, of which 8 are mounted radially on the rotating cutter head. This operation reduces the stand of both beets and weeds, and establishes block spacings of 3½ inches.

The first thinning must be done when the seedlings are small—not over four true leaves—and must be done before the first cultivation. (If cultivation precedes thinning, the soil is left loose and cloddy, and the thinning blades tend to break out remaining blocks.)

After a few days have elapsed, during which the destroyed plants have dried up, the appearance of the stand will determine the advisability of second mechanical operation. If the original stand was so uniform that the blocked stand consists mainly of multiple plants in each block, then it will be desirable to go over the field again, this time employing 16 arm cutters with narrow blades—perhaps ½ inch. This operation will reduce the number of seedlings in each remaining block, and will completely remove some of the blocks. This second machine thinning operation leaves the field in good condition for cultivation of weeds between the rows, and subsequent long handled hoeing for removal of in-the-row weeds as well as removal of excess beet plants.

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LEFT—Don't attempt mechanical thinning in this field! Cultivation has made it hopelessly cloddy.

RIGHT—This is how a field should appear if mechanical thinning is to be accomplished successfully.

CULTIVATION

Because it has always been customary to cultivate all weeds between the rows, this operation might seem to be thoroughly standardized and incapable of significant improvement. This, however, is far from the truth. Of particular importance is the width of the planted row which is left between the cultivator sweeps. Bear in mind that a two inch "core" retains only half as many weeds as does a four inch "core." In order to get the cultivator knives as close to the row as possible without destroying beet plants, the use of disks to define accurately the sides of the "core" is essential.

There is growing interest in rotary cultivation. The Cultro and Byhoe rotary cultivators are both in use, and their popularity is increasing rapidly.

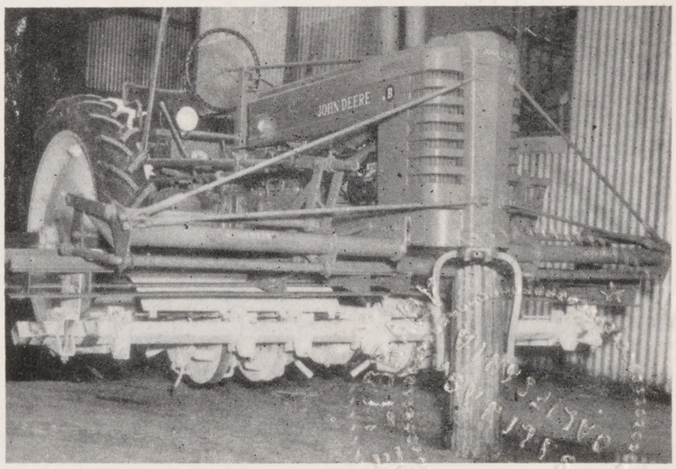

Photo courtesy Byron Peters 7

THE BYHOE is a rotary cultivator which gives vigorous deep cultivation with protection to the crop plants afforded by rolling disks.

FERTILIZER PRACTICES IN THE CENTRAL VALLEYS

By WILLIAM DUCKWORTH

Field Superintendent, Spreckels Sugar Company

THE PRIMARY objective of a fertilizer program in the Central Valleys is to supply adequate amounts of nitrogen to the crop until shortly before harvest. The relationship between high nitrogen levels at harvest and lower sucrose contents has been demonstrated. The excessive application of nitrogen may, in some cases, depress sugar production as much as inadequate supplies of the nutrient. Not only is gross sugar per acre effected but the cost of producing a beet crop is unnecessarily increased. With maximum sugar per acre as his objective, the grower must consider certain factors when planning his fertilizer program. These are:

1) Kind of fertilizer to apply
2) Amount of fertilizer required
3) Time of application
4) Placement of the fertilizer

Sugar beets respond to nitrogen, regardless of the source. Cost of the material, convenience in handling and ease of application are the important factors to consider when deciding on the kind of nitrogen fertilizer to apply. Field experiments in the area have not indicated any significant yield gains due to the addition of phosphoric fertilizers. (Certain acid soils give responses in the form of accelerated early growth of seedlings).

The amount of nitrogen required and the time of application are the most important and yet the most difficult factors to determine in developing a fertilizer program. Time of planting, crop rotation and fertilizer history are the factors having the greatest influence on the time and amount of the fertilizer application. Planting dates in the Woodland area normally vary from early January to late May. Therefore, different planting dates even on the same field may call for different amounts and application procedures of the added nitrogen. In general, on an "average" field 80 to 100 pounds of nitrogen per acre may profitably be applied; however, on many fields in the area higher rates per acre are used.

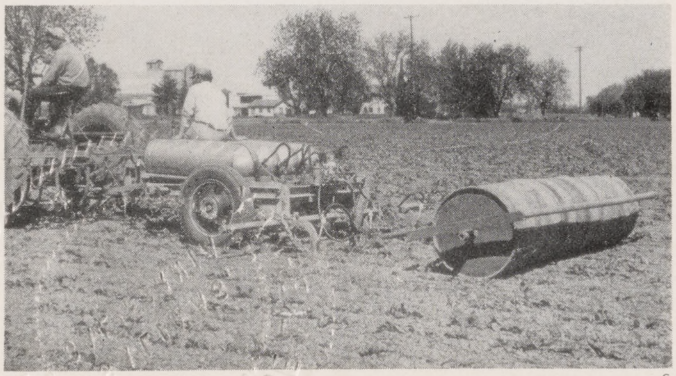

Photo by James Fischer 8

NITROJECTION—drilling in dry ammonia gas—is an economical and efficient means of applying nitrogen, either as preplant or side dressing.

Preplant applications are generally suitable for all planting dates with the exception of very early plantings where there is a danger of excessive leaching from heavy rainfall. Broadcasting, either by plane or ground rig, and injection of NH_3 gas are the methods in most comon use. Beets following crops that are heavy nitrogen users gain by preplant applications if an early deficiency of nitrogen occurs. In many cases decomposition is aided by the addition of nitrogen prior to planting where a large amount of organic matter is present in the soil. Many growers also feel that preplant applications are advantageous because of the reduced risk of sucrose depression due to the presence of excessive nitrogen at harvest.

Side dressing after thinning is the most common method of fertilizer application in the area. In most cases where the fields have a good fertilizer history adequate amounts of nitrogen are available to carry the plants through thinning; however, the late seasons of the past two years and the shortage of field labor have caused the post-thinning applications to be delayed. In some instances the beet crops have suffered from a nitrogen deficiency early in the growing season.

Many growers have been very well satisfied with split applications. Normally the fertilizer applied is split between preplant and side dressing on a 50-50 basis; however, this ratio is varied in many instances. Split applications have the advantage of supplying nitrogen early if a deficiency is present or develops while it also reduces the possibility of losses by leaching and gives some advantages in placement. It is important, that the fertilizer be placed in a position that will allow water to take it into solution and carry it to the root zone. Application of nitrogen by putting it into solution in the irrigation water has been used quite advantageously for supplemental applications but the complete crop fertilizing has not been satisfactorily handled in this manner, due mainly to the problems of water distribution.

In summary, in the Woodland area the source of the nitrogen does not influence yield. Satisfactory yields have been received with the application of all the major types of nitrogenous fertilizers. Time of application influences the yield and sugar per cent; therefore, a grower should plan his fertilizer program so that adequate amounts of nitrogen are available early in the growing season and excessive amounts are not present at harvest. Placement, if in the moisture zone, does not influence yield to a large extent.

A well laid out fertilizer program is essential to produce the maximum yield of sugar per acre; however, the most efficient fertilizer program will not produce a satisfactory beet crop unless proper and timely irrigations, weed control and other approved farming practices are maintained.

FERTILIZER PRACTICES IN THE COASTAL VALLEYS

By HAROLD VOTH

Field Superintendent, Spreckels Sugar Company

BEET GROWERS in the Salinas Valley and neighboring areas have made giant strides in the acre yield of sugar. Their achievements over the past twenty years has been so noteworthy that an examination of their cultural methods seems to be in order.

The following table was computed by A. A. Tavernetti, Farm Advisor of Monterey County, and illustrates in a general way the progress made in sugar beet production in Monterey County during the past fifty years.

Period	Tons Beets Per Acre	Per Cent Sugar	Tons Sugar Per Acre	Average Acres Harvested Per Year
1901-1910	12.5	16.81	2.042	14,764
1911-1920	10.42	18.38	1.907	21,894
1921-1930	10.44	18.80	1.962	10,313
1931-1940	16.97	18.89	3.205	17,525
1941-1950	19.25	17.22	3.314	21,556

Upon studying the above table one can readily see that the total sugar per acre from beets in Monterey County has increased by more than fifty per cent during the past twenty years; in fact, most of this gain was made since 1930. This remarkable increase can be attributed to better varieties, more judicious use of fertilizer and water, and improved farming practices. One should not fail to realize that the advent of the mechanical beet harvester during the past few years has resulted in a slightly lower sugar percentage which is just about offset by a slight increase in tonnage.

Within any locality where sugar beets are grown on a commercial scale it is characteristic that yields and sugar percentages fluctuate markedly from field to field in the same season. This is true here in the Salinas Valley where, despite many advantages of soil and climate, relatively low yields and (or) sugar content sometimes occur. At the same time other fields in this area produce large tonnages with high sugar content. This inconsistency has become the concern of both the processor and the grower.

When a certain grower consistently produces an excellent crop of sugar beets year after year, it is interesting to note what there is about his farming operations which might account for such outstanding results. One immediately asks himself the question: "What is he doing which is different from normal practices in his particular area?"

For example, a certain grower has been averaging twenty-five tons per acre with 17 to 18 per cent sugar for the past five or six years—and on a large acreage. He is doing one thing in his fertilizer program which is basically different from his neighbors' methods. He is including 6 to 10 tons of cow manure per acre in addition to 400 lbs. of 16-20 for pre-fertilizer. This is followed by 300 lbs. of calcium nitrate applied as a side-dressing immediately after thinning. Besides adding nitrogen to the soil, the manure stimulates bacterial activity so necessary to maximum utilization of plant foods, and improves the physical qualities of the soil. The use of animal manures for increasing the yields of farm crops and maintaining soil fertility is about as old as agriculture itself, yet it is a practice which tends to be forgotten in the complexity of modern agriculture.

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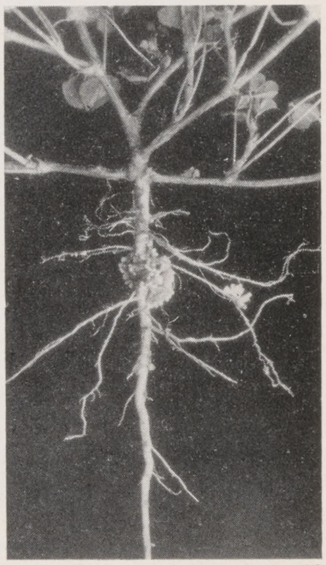
BARNYARD MANURE contributes more to soil productivity than its chemical equivalent in commercial fertilizers. Highly recommended for sugar beets.

Both nitrogen and phosphorus play important parts in sugar beet production. Without either or both it is impossible to grow a satisfactory beet crop. All growers realize this, but in many cases the time of application has been miscalculated. The result is often a field of beets still growing vigorously at harvest time, and with only a part of the potential sugar stored in the roots. Early application of both nitrogen and phosphorus is extremely important in successful sugar production. Recent studies reveal that if a beet crop has not fully utilized most of the available nitrogen it continues vegetative growth, with a consequent reduced sugar per cent at harvest time. Thus the application of nitrogen too late in the growing season can be a detriment to the harvested beet crop. Dollars spent in early fertilizing will eventually mean more dollars in the farmers pockets at harvest time.



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LEGUMINOUS COVER CROPS, with their nitrogen — fixing root nodules, contribute both nitrogen and valuable humus.

CARL J. MORONEY *Photo by Boye*

Mr. Carl J. Moroney, Chairman of the Board of Directors of Spreckels Sugar Company, died at his home in San Mateo on November 27, 1951, after an illness of several months. Mr. Moroney was born in Greensburg, Indiana, in 1886, was graduated from Stanford University in 1910 and shortly thereafter started work with the Western Sugar Refinery of San Francisco as a draftsman. Possessed of exceptional administrative as well as technical ability, he rose in a comparatively short time to the position of Refinery Manager. His association with Spreckels Sugar Company began in 1929, when he was made Technical Assistant to the President of that Company. In 1933 he became Vice-President and in 1946 President. He was elected the first Chairman of the Board of Directors in June of 1951.

His entire career of forty-one years was devoted to the sugar business in California. He had great faith in the future of this State's beet sugar industry and worked tirelessly for its continued growth and betterment.

Mr. Moroney was a staunch friend of the sugar beet grower and frequently expressed his conviction that anything of benefit to Spreckels' growers ultimately benefitted the Company. He backed up this belief by building within Spreckels Sugar Company a large and efficient Agricultural Department, devoted to the study and improvement of beet growing methods and providing service to the grower.

An engineer by profession, Mr. Moroney accurately appraised the opportunities for mechanization in sugar beet agriculture. As early as 1938 he was instrumental in forming within the U. S. Beet Sugar Association the Sugar Beet Machinery Advisory Committee, of which he was the first Chairman. This committee took the first steps toward stimulating the mechanization of sugar beet agriculture.

Mr. Moroney's kindly presence and wise counsel will be sorely missed by his associates both in the Company and in the Industry.

SUGAR BEETS ARE AN IMPORTANT CROP IN IRELAND

By AUSTIN ARMER

Agricultural Engineer, Spreckels Sugar Company

IT WAS my privilege to spend two months in the Republic of Ireland with the Technical Assistance Program of E.C.A. (The Marshall Plan as administered through 1951). My work was under the direction of the Irish Sugar Company, Ltd., and the earnest cooperation of this company's executives and agricultural specialists provided every opportunity for me to learn the details of sugar beet production on the Emerald Isle.

In the last few years sugar beets have become an important crop. The Irish Sugar Company has grown in size until it now operates four factories which process the beets from about 60,000 acres. The resulting sugar nearly suffices for local consumption, but additional sugar is purchased on the world market for use in such exported products as jams, milk chocolate and hams.

Because Ireland is bathed in gentle rains 320 days of the year, "irrigation" is a word which the Irish farmer has never heard. The Irish soil has a high native fertility. Despite the prevelance of a tremendous number of stones and a tendency toward acidity, there is a curious lack of weeds. Most of the weeds are, in fact, wild flowers more beautiful than obnoxious. Crimson Flanders Poppies and Sky Blue Violas take the place of California Pig Weed and Water Grass.

Irish farms are, in general, quite small—15 or 20 acres is the most usual size. The average beet contract is less than two acres. Beet farming methods, where land holdings are so small, are necessarily fairly primitive. The seed bed is usually prepared by plowing with one or two horses (occasionally a tractor). The rain slacks the big clods so that only a light harrowing is necessary to form a friable seed bed. The planting rate is very high—twenty pounds of seed per acre is the minimum permitted by the grower's contract. This high seeding rate is necessary largely because of high seedling mortality caused by damping-off organisms. Thinning is frequently done without the help of any tools, the fingers being used to pull out the excess plants.

(Continued on Page 8)

Photo by Alberta M. Armer 12

THE IRISH FARMER'S thatched stone cottage may appear modest, but it has electric lights and radio. 55,000 Irish farms have electric service.

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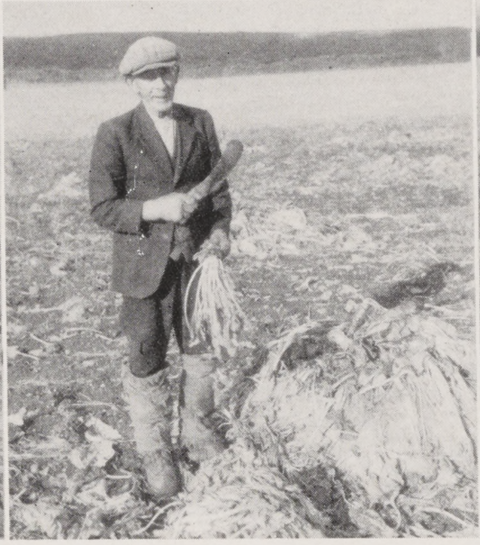
IRELAND'S COLORFUL PAST is reflected by ruins of ancient cathedrals, abbeys and castles. This beautiful citadel is the Rock of Cashel.

MANY SUGAR BEET fields have such light, moist soil that beets are pulled by hand, without the need for plowing.



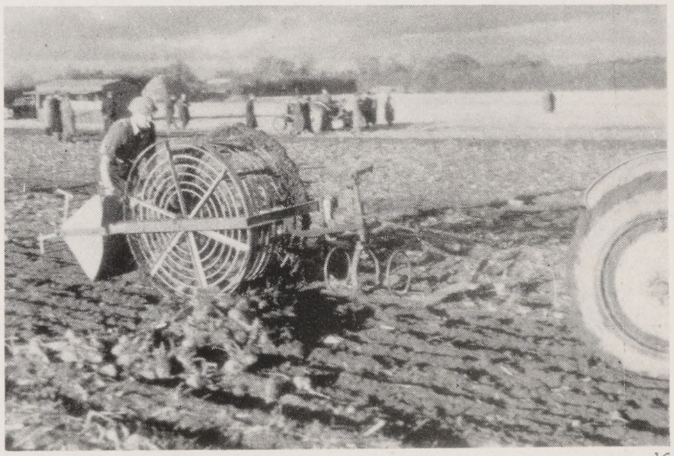
UNTOPPED BEETS are usually heaped for frost protection, and topped by hand. Roots are heaped for later delivery to the factories.

14

THE DUTCH HOE is a rapid topping tool, leaving the topped roots in the ground for subsequent digging and loading.

15

SAVING TOPS for cattle feed is the first essential of the Irish beet harvest. Tops are fed fresh or siloed for later use.



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MANY TYPES of mechanical harvesters are under trial in Ireland. This adaptation of the Roerslev machine originated in Denmark.

Sugar Beet Technologists Hold Biennial Meeting

Salt Lake City was host to over 500 members of the American Society of Sugar Beet Technologists who held their seventh biennial general meeting at the Hotel Utah, February 5th to 8th.

The attendance was the largest on record and was a measure of the value placed upon these meetings by key members of the agricultural and factory staffs of beet sugar processors throughout the United States, Canada and European countries.

Research findings were presented in five sections — Agronomy; Entomology and Plant Pathology; Genetics and Variety Improvement; Agricultural Engineering; Chemistry and Factory Operations. Most of the presentations were highly technical, relating to basic research, and demonstrated an impressive array of accomplishments which are a real credit to the beet sugar industry.

Of direct interest to beet growers were the exhibits of machines and methods for making beet growing more efficient and more profitable. Emphasis was on Spring Mechanization—the phase of beet raising where major cost reductions have been demonstrated.

Flores Now Assistant to Plant Breeder

Robert E. Flores is now assistant to Dr. R. T. Johnson, Plant Breeder with headquarters at Spreckels.

During his seven years of service as a field superintendent, Mr. Flores' spare-time hobby was the collecting and growing of cactus and succulents. He not only acquired one of the nation's leading collections, but produced some outstanding hybrid specimens. His talents and knowledge of genetics led naturally to his present work, which is part of the expanded variety improvement program under way at the Spreckels Plant Breeding Farm.

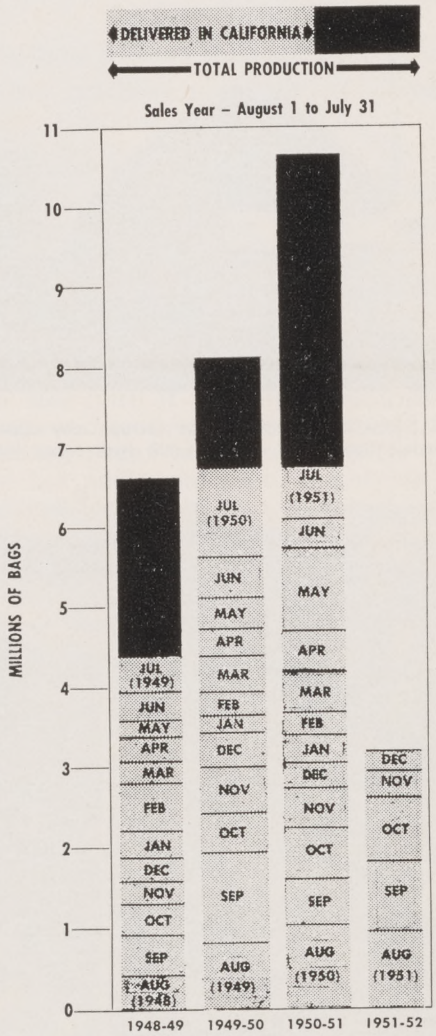
BEETS IN IRELAND

(Continued from Page 6)

Harvesting usually involves plowing the beets either with a conventional Colorado-type lifter or with a horse-drawn mold board plow minus the mold board. In many cases the soil at harvesting time is so wet and soft that no plowing is necessary and the beets are simply pulled up by hand, knocked together to shake off adhering dirt and thrown into heaps for subsequent topping. The Irish topping knife is a good deal broader than ours and has no hook.

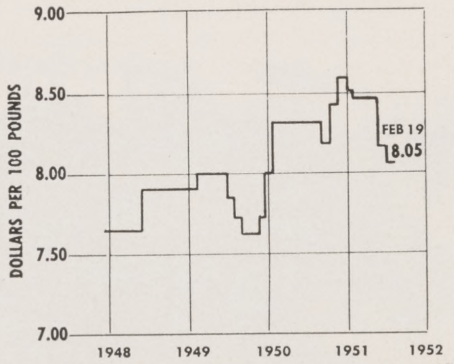
The mechanization of the harvesting has been attempted on a fairly large scale. There are about 600 harvesters in Ireland, representing machines from America, England, Denmark and Sweden. However, these machines can be used only during the infrequent dry spells so that their use is limited.

PRODUCTION AND DELIVERIES OF BEET SUGAR IN CALIFORNIA



QUOTED PRICE OF BEET GRANULATED SUGAR

In 100 Lb. Paper Bags, F.O.B. San Francisco



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The SPRECKELS SUGAR BEET BULLETIN is issued bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers. Mention of specific methods, devices or implements does not constitute an endorsement by the Company. All photographs by the editor unless otherwise indicated.

AUSTIN ARMER, Editor 600 California Fruit Building Sacramento, California

SPRECKELS SUGAR BEET BULLETIN

18

RESEARCH WORKS AROUND THE CLOCK

Night work is routine for the specialists busy on sugar beet agricultural research

BASIC RESEARCH

VARIETY IMPROVEMENT

CULTURAL METHODS

are some of the projects under way in the Spreckel's research program.

Vol. 16 MARCH - APRIL, 1952 No. 2
PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

NEW FACILITIES FOR AGRICULTURAL RESEARCH

By DR. RUSSELL T. JOHNSON
Plant Breeder, Spreckels Sugar Company

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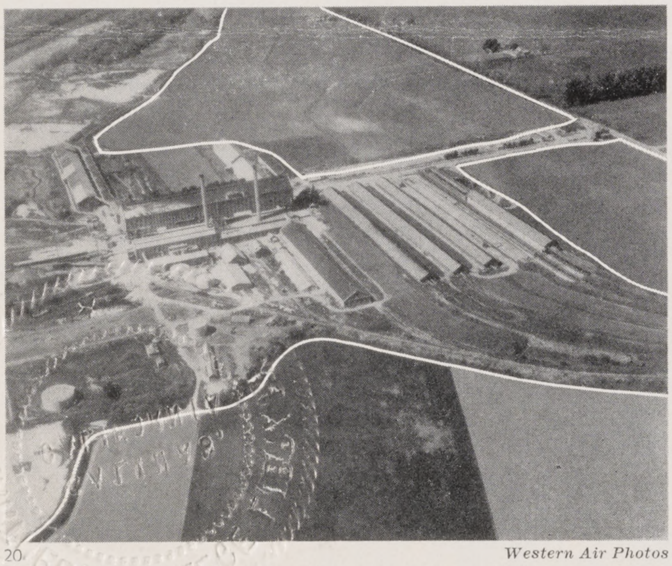
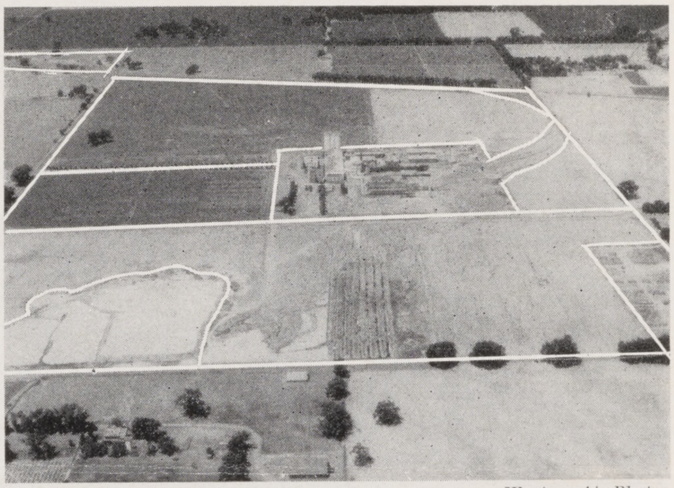
THE AUTHOR, and his assistant, Robert Flores, busy in the Spreckels headquarters greenhouse (pictured on the cover).

As a means for providing additional equipment and land for an accelerated agricultural research program, two of the Company ranches have been made available for this purpose—one at Woodland, the other near Salinas.

At Salinas, that portion of Spreckels Ranch I adjacent to the factory has been taken over, providing a compact research center. The new experimental station at Spreckels includes approximately three hundred acres of land. While this may sound like a tremendous acreage on which to conduct sugar beet research, only a small portion of it will be in sugar beets each year. In an effort to keep the nematode population at a minimum a long rotation will be practiced between successive sugar beet crops. This means that sixty to seventy acres will be available each year for experimenting with new cultural methods and new varieties.



20 *Western Air Photos*
THE SPRECKELS plant breeding farm includes 320 acres adjacent to Factory 1 at Spreckels, near Salinas. (Farm fields outlined in white).

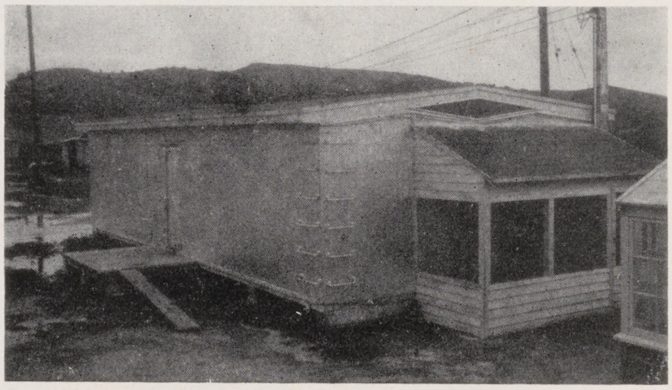


21 *Western Air Photos*
THE WOODLAND plant breeding farm surrounds Factory 3 at Woodland. (Farm fields outlined in white.)

In addition to the experimental farm at Spreckels, the land around Factory 3 at Woodland has been taken over for experimental work. The land available there is approximately one hundred acres. Because of certain weed and nematode problems it will be a short while before this land is satisfactory for some types of experimental work, but it represents considerable potential acreage available for sugar beet research.

An example of the special equipment requirements essential to a beet seed breeding program is the fact that the sugar beet is a biennial plant. Thus, after the seedling emerges, it remains vegetative for the first season, and after its winter dormancy, will produce a seed stalk, or "bolt." Even young seedlings can be made to produce a seed stalk. Because the development of new varieties is dependent upon seed production, a sugar beet breeding program requires certain facilities which can be used to stimulate seed production at any time of the year desired. Two of the most important of these facilities are a greenhouse in which growth can be maintained at any season of the

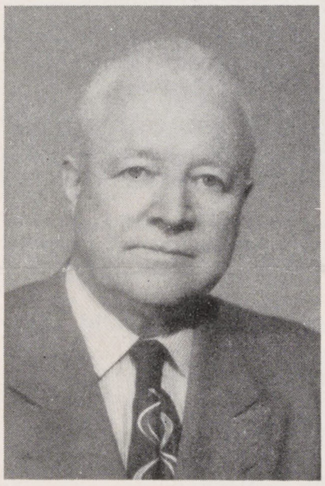
(Continued on Page 13)



22
THE COLD CHAMBER at the Spreckels headquarters makes possible a wide range of developments, including seed strains resistant to bolting, yet able to germinate at low temperatures.

THE 1951 BEET LEAFHOPPER CONTROL PROGRAM AND THE 1952 OUTLOOK

By H. M. ARMITAGE
Chief, Bureau of Entomology,
California State Department of Agriculture



23 Coronet Portraits

CURLY top virus has been of only minor importance during 1951 and all indications point to a similar, favorable situation in 1952. This is believed largely the result of the emergency spraying in October, 1950, and again in October, 1951, of an extensive acreage of Russian thistle present on open range land lying between the agricultural areas in the San Joaquin Valley and the foothills to the west. These operations reduced the epidemic numbers of leaf-hoppers which this thistle had produced and harbored, before they could escape to the foothills for the winter. Unquestionably these measures were supplemented by seasonal conditions during the winters following their application which adversely affected the remaining leafhoppers and favored routine winter control operations.

CONTROL WAS EFFECTIVE

There is no doubt, considering the potential possibility of damage present in such numbers, that in the absence of such spraying the situation would be far different, with losses comparable to those experienced in 1950. Even U. S. 22 suffered severely that season in the critical area against the hills in Fresno County. One such planting produced only three and one-half tons of beets per acre while one-half of that same planting in which control measures were attempted produced only seven tons. Beet growers should still have a very definite interest in seeing that present control operations are continued in spite of the protection normally given by use of disease resistant seed.

In 1951 sugar beets showed the highest production per acre in several years, part of which might properly be attributed to the low incidence of disease experienced by all growers of susceptible crops. Growers of early table tomatoes in the San Joaquin Valley experienced less than seven per cent diseased plants against a normal expectancy of 20 per cent, while the seasonal average for all types of tomatoes was less than one per cent diseased plants.

It is significant that such disease as did occur in 1951 appeared so late in the life of its host that it did not affect production and a full crop was harvested. This is closely tied in with the fact that the number of leafhoppers surviving the fall and winter control operations was so few at the time of the spring flight that the small initial numbers finding their way into the agricultural areas required considerable time to build up to damaging numbers. The result was that the full affect of the disease, as transmitted by them, was not felt until after the crop had matured and been harvested.

THE 1951 PROGRAM

The spray program as directed against Russian thistle in the fall of 1951 was not greatly different from that of 1950. The acreage treated was slightly larger, covering 145,731 acres as compared with 140,639 in the previous year. An additional 28,708 acres was treated during the winter, spring, and fall operations, bringing the total acreage treated in 1951 up to 173,439 acres. The number of leafhoppers was not as great as in 1950 but was still highly critical. The area of operations, however, shifted definitely to the south, most of the acreage treated lying south of Coalinga. In 1950 about one-half of the acreage treated lay north of that point to and including the Los Banos Hills. Much of this northern acreage succumbed to drought and wind erosion, as did an appreciable acreage in the Kettleman-Lost Hills-Devil's Den area. This was balanced by major increases in North Belridge in the vicinity of Gardner field and in the Tejon Ranch area. Approximately 15,000 acres had to be treated for the first time in the Cuyama Pass west of Maricopa. This was of significance with respect to beet planting in the Cuyama Valley.

The situation north of Pacheco Pass has been further favored by cleaning out extensive scattered stands of thistle not amenable to economic spraying, including that along roadsides and ditch banks. Seventy-five workers were employed during the summer months, eliminating such stands on 23,316 acres and from 207 miles of ditch banks and 1,247 miles of roadside.

The accompanying bar chart shows graphically how the curly top virus has been building up during the five years prior to 1951, and the marked decrease following the first emergency spraying of thistle in October, 1950. The values are based on the incidence of disease observed in plantings of processed tomatoes which represent a highly susceptible host, widely planted in the control area. The situation in the Salinas Valley is comparable to that in the San Joaquin Valley and influenced by the same factors.

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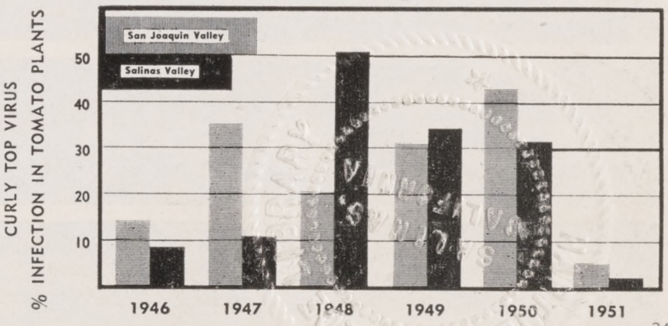

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CURLY TOP INFECTION on tomatoes dropped tremendously in 1951 as a result of the State's control activities.

A PROGRESS REPORT ON SPRING MECHANIZATION

By AUSTIN ARMER
Agricultural Engineer, Spreckels Sugar Company

A discussion of the general problems of spring mechanization was presented in the January-February issue of the Spreckels Sugar Beet Bulletin. There has been such an increase of general interest on the subject in the last few weeks that it seems appropriate to publish the latest information concerning equipment, methods, and grower acceptance.

THE PRESENT SITUATION

Interest in mechanical thinning and related mechanization of spring work has always been in proportion to the threat of labor shortage. In other words, growers have never expressed serious interest in spring mechanization unless there existed the threat of labor shortage. At the present time, California sugar beet growers are turning their attention to the progress in spring mechanization which has been made in those states where labor shortages have been a stern reality for many years.

The California grower also recognizes the possibility of saving much of the cost of crop production, as well as the reduction of his dependence upon a timely supply of field labor.

For these reasons there has been a tremendous upsurge of grower interest in mechanical thinning equipment and methods. Implement dealers in the Spreckels Sugar Company beet growing areas have given field demonstrations of various spring mechanization tools and demonstrations have invariably been well attended and have resulted in firm orders for equipment beyond the dealers ability to deliver.

Whereas the Spreckels Sugar Company proposed to introduce mechanical thinning on a strictly experimental basis this year, it appears that their limited number of Silver Thinning machines will be put to work on large acreages rather than on experimental plots alone. In fact the demand on the implement yard at Sacramento for thinning

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FIELD DEMONSTRATIONS of mechanical thinning and weed control have been attended by large numbers of interested growers. Implement dealers are now stocking thinning machines and rotary cultivators of several reliable manufacturers.

equipment is so great that some of the old Dixie thinning machines are being rebuilt in order to function properly in connection with present day methods.

METHODS NOW IN USE

The operations of thinning and weed control involving mechanical aids generally fall into the following schedule:

1—A fairly heavy and uniform stand of seedlings is insured by planting 5 to 8 pounds of processed seed into known moisture, or into doubtful moisture, followed by irrigation for germination.

2—Reduction of this stand to a population of 150 to 200 beet hills per hundred feet of row is started by chopping out 1½" gaps on 3½" centers.

3—Further stand reduction and singling is accomplished by chopping out ½" gaps on 1¾" centers.

4—Final stand reduction and first weeding is accomplished by a long handled hoeing crew.

5—Cultivation for weed control is done as required, frequently with one of the power driven rotary types of cultivator.

The thinning machine which has accounted for the greatest acreage in Colorado is the Silver Thinner. In Michigan the Dixie Thinner has been dom-

THE ORIGINAL STAND as it appears after the first cultivation. (It would have been better practice to thin before cultivating if field conditions permitted).

MACHINE THINNED stand—properly reduced by two passes of the thinner, then cultivated to control weeds.

FINAL STAND, after the long-handled hoe crew has removed beet clumps and in-the-row weeds.

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inant. Implement dealers in California are making arrangements for handling both of these machines.

ROTARY CULTIVATORS GROWING IN FAVOR

Rotary cultivating tools have been in use in Germany and England for many years but are only now coming into full prominence in Western American beet fields. The Byhoe is one of the most recent of these devices and in addition to cultivation it can perform a very satisfactory job of seed bed preparation much like that produced by the Rototiller or the Seaman tiller.

The Cultro rotary tiller is a lighter tool requiring less power and designed primarily for producing a fine mulch on either side of the crop row and at the same time throwing enough fine dirt into the row to smother small weeds.

The Chattin Rotary Cultivator-Mulcher is the latest machine to be introduced in California. It claims the advantages of replaceable blades, rotors shaped to fit the sides and tops of beds, and deflector shields to rebuild bed shoulders.

These rotary cultivation tools are rapidly becoming available from regular implement dealers throughout California, and show promise of becoming indispensable row-crop tools.

To include a description of long handled hoeing technique under the heading of Spring Mechanization may seem out of place. However, it must be emphasized that spring mechanization means the use of all available machinery to *reduce* labor requirements — but not to completely eliminate them. The day may come when the art of spring mechanization has completely solved the labor problem, but at this date it is only fair to recommend it as a means for reducing and not eliminating the need for manual operations.

27 *Photos by Robert C. Chattin*

THE CHATTIN Rotary Cultivator-Mulcher has the advantage of special rotors fitted to the beds. (See inset)

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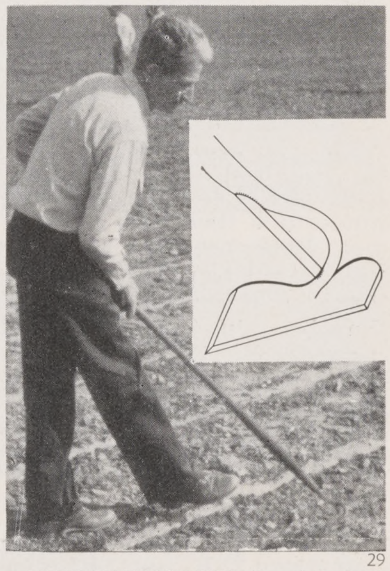
THE BYHOE performed this spectacular job of weed destruction on the Timm and Pistor contract near Dixon.



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LONG-HANDLED HOE (inset) is demonstrated by Carl Hahn, beet grower and labor contractor, who has trained several expert long-handled hoe crews.

RESEARCH FACILITIES

(Continued from Page 10)

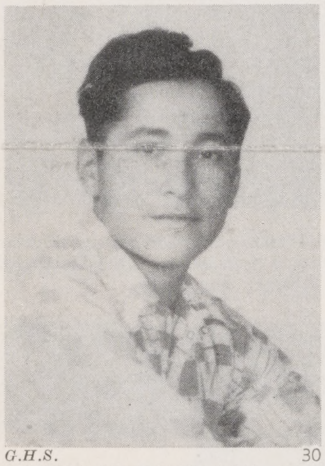
year and a controlled low temperature room in which winter temperature can be provided. With these facilities, beets selected at any time of the year can be placed in the cold room long enough to change from the vegetative stage of growth to the reproductive stage. At this time they can be placed in the greenhouse under supplementary light where they will flower and produce seed. In this manner, the breeding of improved varieties can be speeded up, and in addition, can be conducted during any time of the year. In the past year Spreckels have acquired additional greenhouse space and obtained a storage room with a refrigeration system where temperature can be maintained at any desired level.

While all of these new lands and equipment will lead to valuable new varieties and methods, the Company is keenly aware of the grower's place in this program. The grower's support, represented by the plots he provides throughout all beet growing areas, is still the foundation upon which a successful development program rests.

By combining these far-flung field experiments with a centralized experiment station, Spreckels Sugar Company will determine the best cultural practices for growing sugar beets, and provide its growers with the most productive varieties which can be produced by plant-breeding science.

4-H SUGAR BEET PROJECTS SUCCEED

A year ago the SPRECKELS SUGAR BEET BULLETIN announced that growing sugar beets was to become a 4-H Club project sponsored by the farm advisors in principle beet growing areas. It is therefore with real pride that we report the successful completion of 4-H sugar beet projects in both the Salinas and Woodland factory districts.



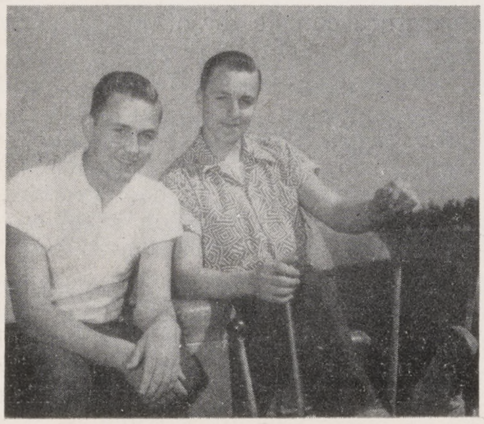
G.H.S. 30
FRED DEL RAZO of Gilroy.

Fred Del Razo, 17, is a sophomore at Gilroy High School. An enthusiast on all farming subjects, his heart is in his 4-H activities, as is abundantly demonstrated in his beet project achievement. He grew 4 acres of beets, which yielded 23.65 tons per acre with 16.64% sugar. He kept accurate costs on every operation, and they indicate a thoroughness which would set a good example for many a veteran grower.

In the Woodland District Wesley and Randy Reiff undertook their beet growing as a partnership project. Both brothers are active in Woodland High School activities—Wesley, 17, is student body president, is on the varsity football and track teams, and has been in 4-H work for 5 years—was, in fact, president of the Laugenour 4-H Club. His musical talents have earned for him a title—"The Singing Cowboy of Woodland."

Randy, 15, is vice-president of the freshman class at Woodland High, plays football on the B team, and has also been a 4-H clubber for 5 years.

Their beet project was a great success. They harvested 25.67 tons per acre on a 6.87 acre contract, and their names will appear on the 1951 Honor Roll of Spreckels growers whose crops exceeded 25 tons per acre.



WESLEY (left) and Randy Reiff of Woodland.

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THE PRODUCTION OF SUGAR BEET SEED

By SAM C. CAMPBELL
Manager, West Coast Beet Seed Company

THE sugar beet seed which the Spreckels Sugar Company issues to its growers is produced by its seed growing agency, the West Coast Beet Seed Company of Salem, Oregon. This seed producing firm was established originally in 1935 to provide a portion of the seed requirements of three sugar companies, including Spreckels Sugar Company. In 1940, the firm was reorganized to serve several other sugar companies and it now produces part or all of their seed requirements.

The operations of West Coast Beet Seed Company are confined to four separate seed producing areas — the Willamette Valley in Northwestern Oregon, the Rogue River Valley in Southern Oregon, the Hemet-San Jacinto Valley in Riverside County, California and the Tehachapi Valley in Kern County.

Each year the various sugar companies request that the seed company produce for them certain amounts of seed of one or more varieties. It is then the responsibility of the seed company to secure contracts with farmers who will produce the approximate amount of the seed requested. The seed company is also responsible for placing the acreage in each area so that there is little chance of contamination by pollen from other seed fields of different varieties.

There are many varieties of seed produced—perhaps as many varieties as there are localities where beets are grown for sugar production. The matter of varieties and their characteristics, particularly those used in the beet growing areas of the Spreckels Sugar Company, are well described in an article in the May-June, 1951, issue of the Spreckels Sugar Beet Bulletin entitled "Recent Developments in Sugar Beet Breeding" by Dr. John S. McFarlane and Charles Price.

HOW THE CROP IS GROWN

There is some variation in cultural methods in the various seed growing districts, due, primarily, to climatic conditions. Usually the beets are planted during the month of August on land which has been fallowed since spring. The planting is quite similar to that of beets for sugar production, except that whole seed and not processed seed is used. Planting rates vary from about 9 to 15 pounds of seed per acre. The stand is left unthinned and closely cultivated. High nitrogen fertilizers are either pre-applied or sidedressed. If dry weather prevails in the fall, irrigation is essential. The beets usually make rapid growth in the fall and the heavy foliage resulting from the unthinned stand tends to impede weed growth, particularly annuals, which germinate with cool fall temperatures. If grasses become a problem they can, in most instances, be adequately controlled with IPC, a selective weed spray material.

After the first few heavy frosts the foliage flattens down and the outer leaves wither and slough off. The leaves in the crown remain quite green but there

is very little, if any, growth of the root during the cold period. As a result of the cold exposure and near dormancy of the plant the beet plants change over from the vegetative to the reproductive stage.

Freezing of individual plants in a thin stand will occur occasionally but the loss of stands due to freezing is negligible in the seed growing districts.

In the spring the beets start new growth and as soon as ground conditions permit the crop is cultivated and heavily fertilized. Seedstalk formation, or bolting, begins in late April and thereafter the plants grow very rapidly, reaching a height of about 5 to 6 feet by June 1st. At this time the first flower buds begin to open and by June 15th the crop has reached the full bloom stage of development. The plants continue to grow during the period of seed formation and by the time they reach maturity they may reach a height of 9 feet, although the weight of the seed tends to force them down to 5 or 6 feet.

HARVESTING AND CLEANING

The crop is usually harvested in late July and early August. The harvest operation is fully mechanized and consists of two phases. First the crop is windrowed with large, specially constructed windrow cutters. The crop is then allowed to cure in the windrow for about ten days before threshing. Threshing is accomplished by the use of specially constructed combines with pick-up attachments. Factory-made combines can be utilized for threshing the seed, but their capacity is limited.

After threshing, the seed is delivered to designated warehouses where cleaning is done under close supervision. It is highly important that seed lots of different varieties do not become mixed at the warehouses and it is necessary that the seed handling equipment be thoroughly cleaned when changing from one variety to another. Samples are taken from each lot of seed as it is bagged off from the cleaner. These are submitted to authorized seed testing laboratories for germination and purity tests. When the seed has passed the requirements under the contract it is ready for delivery to the sugar companies.

High yields of seed, though important in the seed producing phase of the business, are not as important as the quality of seed produced. The seed company, in dealing with growers, not only stresses cultural practices which will increase yields of seed but also stresses practices which will tend to improve the germination of the seed produced. Seed produced during the past few years has been consistently high in germination, averaging approximately 90%.

Seed yields vary considerably by districts. The Tehachapi area is probably the highest producing area with the Hemet Valley area running a close second. Yields of from 4000 to 5500 pounds of clean seed per acre are not uncommon in these areas. Yields in the Oregon areas will average approximately 1000 pounds less than in California.

The seed company not only produces large quantities of commercial seed but also produces much of its own stock seed. It also cooperates closely with the various U. S. D. A. and sugar company plant breeders in the planting and production of small lots of seed for experimental purposes.

A SEED FIELD in the spring, just before seed stalk formation.

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A SEED FIELD approaching the full bloom stage of development.

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A MATURE seed field ready for harvest.

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THE WINDROWING operation in a heavy seed crop.

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THRESHING BEET seed with combine specially adapted to this crop.

36 *Photos by Sam C. Campbell*

LEAFHOPPER CONTROL

(Continued from Page 11)

The results of the 1950 operations, in terms of leafhoppers killed, was excellent. In many locations before spraying they averaged more than 500 per sweep of a standard field net, indicating an estimated population of over fifty million per acre. Following treatment many locations showed no leafhoppers present and others not more than one or two per ten sweeps. It is believed that a more complete job was done in 1951 than in 1950, with more thin stands and isolated patches covered than was possible in the preceding year. This better coverage was partly offset by the presence of more thistle in field margins, roadsides, and waste places outside of the control zone.

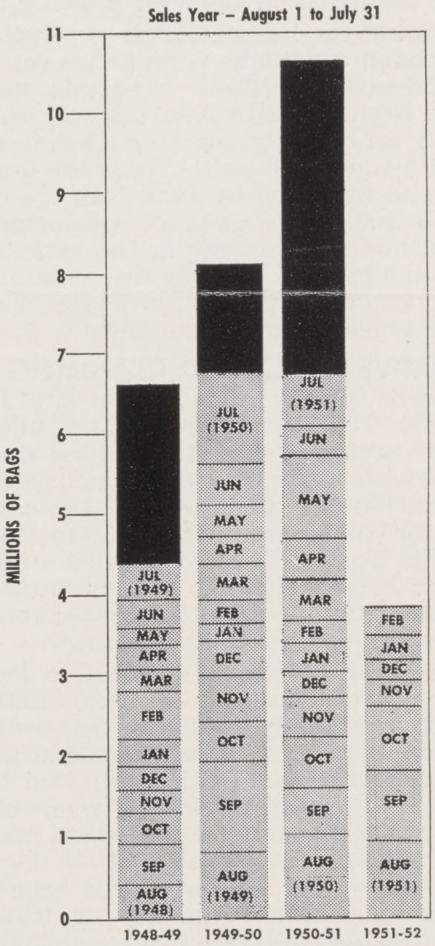
A modification in the control program made it possible to meet the doubled cost of materials and their application without asking for additional funds. The material used was reduced to one pound DDT, actual, in two gallons of diesel oil per acre rather than 1½ pounds in four gallons as originally used. This was applied from a height of 25 feet in 100 foot swaths rather than at thistle-top level in 50 foot swaths. This change was made on recommendation of Federal research workers, and the results were equal to those of 1950.

A NEW CONTROL METHOD

A contract was entered into between the Department and the University of California, under which funds were provided by the former to permit the initiation by the University of an immediate world search for parasites of the leafhopper. As a result, Dr. Norman Frazier, of the University staff, visited the Mediterranean region, confirmed the occurrence of the local species of leafhopper in that area and observed the presence of various species of natural enemies. During this preliminary survey a species of egg parasite was collected and small colonies subsequently liberated in the Coalinga area. These studies will be continued by the University.

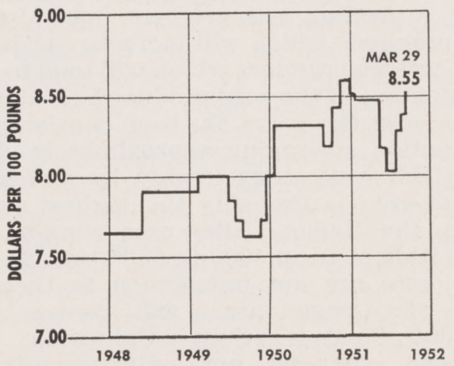
While excellent results appear to have been obtained to date it should be pointed out that it is never possible to get a 100 per cent kill, and that under favorable conditions a small number of survivors can develop later into damaging numbers. Nevertheless, it is felt that where the odds were greatly in favor of serious crop losses this year, the emergency spraying has again changed these odds in favor of a successful crop year from the standpoint of curly top losses. Above-normal rainfall throughout the control area during the past winter and spring should be adverse to both the leafhopper and the Russian thistle and further assure a favorable situation in 1952. Even the delayed planting which apparently is resulting from the prolonged rainy season would not seem to prevent a serious problem this season in view of the low population of hopper that is expected in this season's spring flight.

PRODUCTION AND DELIVERIES OF BEET SUGAR IN CALIFORNIA



QUOTED PRICE OF BEET GRANULATED SUGAR

In 100 Lb. Paper Bags, F.O.B. San Francisco



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The SPRECKELS SUGAR BEET BULLETIN is issued bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers. Mention of specific methods, devices or implements does not constitute an endorsement by the Company. All photographs by the editor unless otherwise indicated.
AUSTIN ARMER, Editor 600 California Fruit Building Sacramento, California

SPRECKELS SUGAR BEET BULLETIN

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THINNING BEETS

Can be done the easy, economical mechanical way.
Spreckels growers have demonstrated that

IMPORTANT COST SAVINGS
VIGOROUS, WEED-FREE STANDS
AMPLE, WELL DISTRIBUTED POPULATION

can be accomplished with mechanical methods of thinning and weed control

Vol. 16 MAY - JUNE, 1952 No. 3
PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

THE INFLUENCE OF RESEARCH ON AGRICULTURAL TRENDS

By JAMES H. FISCHER
Secretary-Treasurer, Beet Sugar Development Foundation

THE results of research and developmental work are all too often accepted as a matter of fact. This is unfortunate, particularly when we consider the many long, diligent hours which are spent in anticipating the trends of agriculture and the concentrated studies which are conducted on the troubles which thus arise.

The term "research" used in this article will not mean solely basic research on an established basis but also research which is conducted by the farmer himself. The dictionary definition of research is "A careful inquiry or investigation, the effort to find new information by experiment or investigation." The American farmer, through traditional inquisitive American manner, is actually a research man in the fact that he is constantly looking for the reason why certain troubles affect his crop production or he is actually experimenting to improve his methods and procedures. Unknowingly, he is contributing materially to an over-all research program. The problems Farmer Jones solves need no further investigation—problems he cannot solve are considered with his neighbor to the north, his neighbor to the west, his other good neighbors, and thus develop into a problematic trend which warrants further investigation by the trained specialists.

The recipe for development of agricultural trends consists of a desire to improve production, establishing a problem, the desire to solve the problem, leavened with sound research and development work, sprinkled heavily with persistence and cooperation. This recipe allowed to simmer and boil, tasted and proclaimed by others will forthwith grow until it actually becomes a trend in agriculture.

There have been many such recipes in the development of American agriculture which evolve into trends and subsequently, become common practice. Most of these have been tagged with eventual reduction in labor, consequently, reduction in production costs.

The most outstanding recent trend in sugar beet production was acceptance of mechanical harvest which has developed now into a common practice on 80% of the total U. S. beet acreage. Common practices do not always represent the ultimate in procedures. Harvesters today do not work to the complete satisfaction of either the producer or the processor. The over-all trend now points toward a smaller high capacity machine which has the maximum recovery, more proper disposal (saving) of beet tops and preferably a one-man operation. There appears to be no marked preference between machines which top the beets above the ground and those which top in the ground. This will probably remain an area preference, dependent particularly upon cultural practices. From a tonnage standpoint, more beets have been delivered from machines which top beets in the ground.

In the over-all picture, machine thinning now has the number one position for close observation. It can be said that there is a definite trend toward machine thinning. Many efforts have been expended in attempts to devise machines which closely approximate the work of hand labor. Initial efforts in this line were extended toward down-the-row or across-the-row machines which blocked fields to the final spacing desired. The Red River Valley of Minnesota and North Dakota accepted the practice of across-the-row blocking and such procedures are almost universal in the valley. This program is used in other localities to the acceptance of those who can beneficially work this procedure into their farming system.

Down-the-row thinning machines as now used leave three to four small blocks in every foot of row. Such a method met with acceptance on 89,000 acres of beets in 1951. The results experienced by those using the down-the-row thinning method display an apparent solution to many of the early season thinning problems. This operation either as a partial or complete job, is expected to expand materially and develop into a sound procedure in beet culture.

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DOWN-THE-ROW thinning machines operated on 89,000 acres of beets in 1951. California growers are now using them extensively.

Weed control remains the greatest problem in agricultural production. In limited areas, chemical materials are used commercially as a solution to the control of grass-type weeds. It is unfortunate that soil, moisture and seasonal conditions affect the success of such measures. It would be erroneous to state that there appears a trend toward chemical weed control of weeds in beets. Men in basic research are still searching for suitable chemicals. Practical forms have yet to be developed.

We must still plan on weed control as a mechanical or hand job. Machine thinners have offered an excellent aid to the plan for in-the-row cultivating out of weeds. Since machines do not have the faculty of selection, it remains a job of the hand thinner to accomplish the final weeding.

Rotary type cultivators are being used more extensively each season. The slight covering within

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THE FARMER and the manufacturer are important contributors to agricultural research. Byron Peters (right) originated the "Byhoe" rotary cultivator, and M. R. Robinson (left) is mass-producing them.

the row and shattering of the top soil, effected with rotary cultivators have materially reduced weed populations within the beet rows. In effect, the rotary cultivators accomplish a closer cultivation.

The mounting sales of commercial fertilizer definitely indicate a trend toward the increased use of commercial fertilizers. In 1951, 19½ million tons of fertilizer were used on U. S. farms.

The application of such fertilizers themselves, reflects a tendency. The California-initiated program of side-dressing anhydrous ammonia has spread now through most of the beet belts and can be definitely classified as a trend in the method of application of nitrogen to our crop. Although the practice of split application of fertilizer has been used commercially for a number of years in many areas, such has not been the case in others. There definitely is a tendency toward the application of certain fertilizers at plowing time, with the second application as a side-dressing operation during the early growing life of the beet.

Fortunately, there is evidence that growers are improving rotation practices. Farmers who have not previously practiced systematic rotation, now at least plan it. Rotation is imperative to retention of a mellow soil structure, a high level of plant nutrients and effective in suppressing harmful soil organisms. Research, be it at the farmer's level or at a technical level, will be of little avail if sound farm management is not observed.

It is necessary that we stand back and take a look at today's trends in agriculture. We should make certain that they are sound and in no case, soil depleting. The soil we use today will be used for many succeeding generations. We must be certain that our successors have conditions equal to, if not better than those we had. Collectively, we can assure their future through a sound program designed to guide agricultural trends with the aid of research.

SPRECKELS GROWERS ARE TAKING ADVANTAGE OF SPRING MECHANIZATION

IN the past two issues of the Spreckels Sugar Beet Bulletin, the advantages of Spring mechanization have been pointed out and suggestions for methods of thinning and cultivating have been presented.

The response from our growers has been more than gratifying. Already more than thirty growers have completed the thinning and cultivating of over 3,500 acres by mechanical means. There is a good prospect of these members doubling before the thinning season closes. The demand for thinning machines far exceeds the supply, but growers are cooperating closely and keeping every machine busy all of the time.

Some of the results are outstanding—in many cases the mechanical work is superior in quality to some of the adjacent hand work. Machine thinning seems to have the advantage that it tends to leave high populations—from 140 to 180 beets per hundred feet of row. Hand labor has the opposite tendency — to save time by chopping big gaps between beets and leaving populations of 100 or less.

Perhaps the most important lesson that growers have learned from their experience with mechanical thinning is that thick, uniform seedling stands are essential. All of the best examples of Spring mechanization have been found in fields where the seedling stand was heavy and free from blank spaces of 12 or more inches.

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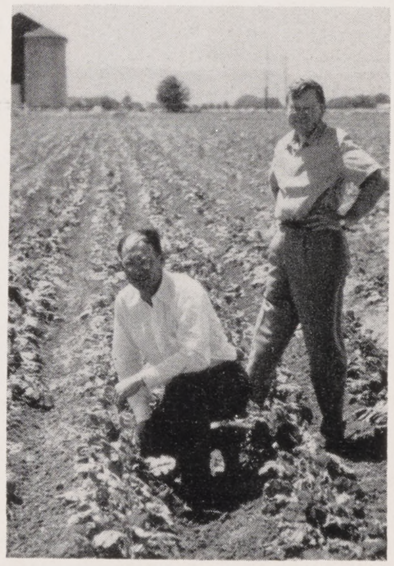
THIS EXAMPLE of rotary cultivation was published in the March-April Sugar Beet Bulletin.



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THIS IS the same field after mechanical thinning and long-handled hoeing — at a labor cost of $6.50 per acre. Herman Pistor (left) and Olin Timm may well smile.

The Honor Roll For 1951

These growers have produced crops yielding 25 or more tons per acre. Spreckels Sugar Company congratulates them; they have demonstrated that high yields on sizeable acreage result from good farming methods.

GROWER	ACRES HARVESTED	TONS PER ACRE	LBS. SUGAR PER ACRE
William D. Crinklaw	32.5	39.52	11,959
Raymond Martin	78.8	38.53	11,205
William D. Crinklaw	37.8	38.43	11,929
M. B. Avilla	27.0	37.27	11,598
Martella Bros.	40.8	35.92	10,760
P. & A. Breschini	22.3	35.85	9,995
R. G. Wood	7.0	35.41	10,807
Fred Banducci	150.0	34.99	9,475
Peter Lesnini	43.5	34.73	10,550
Art Manzoni	22.0	34.63	9,655
Paul Anthony	38.5	34.30	10,455
Paul Hanson	75.0	33.26	9,945
Carl H. Becker	222.0	33.23	9,324
John Gardoni	31.8	32.12	9,830
Floyd Warner	51.0	31.74	9,611
Tony Homen, Jr.	49.6	31.47	9,685
Lind Bros.	11.0	31.45	9,353
Edward A. Johnsen	34.5	30.90	10,019
Henry Damsen	9.0	30.90	9,505
M. G. Da Rosa	57.4	30.86	9,356
Walter A. Barlogio	21.0	30.83	9,737
Tognetti Bros.	41.8	30.67	9,513
R. G. Wood	112.0	30.09	9,581
J. and G. Oki	30.0	30.05	8,023
Richard Moore	147.0	30.05	7,681
Storm & Rhodes	27.4	29.97	8,141
James A. Petit	42.0	29.53	9,923
Tavernetti Ranch	10.0	29.37	8,642
Geo. P. Lowrie	84.5	29.33	10,012
Lido Giovacchini	65.0	29.32	10,315
Estes & Strobel	47.7	29.25	7,688
H. F. Trafton & Son	22.5	29.21	9,206
Geo. L. Barry	40.0	29.20	8,976
Nic Albanese	2.5	29.11	8,867
Farley Fruit Co.	49.0	28.81	8,124
Kenner & Usrey	58.8	28.79	9,455
Richard E. Mahon	30.0	28.78	9,348
Salinas Valley Veg. Exch.	19.2	28.77	8,401
C. Strehle & Son	22.0	28.63	9,162
P. R. Dixon	47.0	28.60	8,403
Fred Banducci	80.0	28.60	8,345
V. Vanoli & Son	35.5	28.58	7,798
L. Knight Co.	30.0	28.48	8,624
T. G. Bacciarini	42.5	28.44	8,872
Heckert & Warford	158.0	28.32	8,615
W. J. Duffy	50.0	28.31	8,578
Mitchell Resetar, Jr.	6.0	28.24	8,829
Arnold Collier	120.0	28.17	8,902
Farley Fruit Co.	41.2	28.14	8,015
Tamagni Bros.	44.0	28.14	7,878
Hanson & Barkley	40.0	28.13	9,170
G. W. Herbert	87.1	28.11	9,131
Tom Storm	30.0	28.01	8,134
Salinas Valley Veg. Exch.	46.2	27.88	8,108
Schween Bros.	41.5	27.86	7,656
Pietro Pedevilla	24.0	27.80	7,885

GROWER	ACRES HARVESTED	TONS PER ACRE	LBS. SUGAR PER ACRE
Alfred Riva	15.0	27.80	7,806
Dan G. Best	159.0	27.76	8,028
W. R. Stephenson & Son	26.9	27.72	7,380
Fabretti & Dedini	42.0	27.55	7,985
Michael K. Reed	47.0	27.52	7,490
Irvin Dethlefsen	23.0	27.49	6,736
Thomas D. Harney & Son	55.6	27.33	8,479
James Vanoli & Camillo Bravo	38.9	27.26	8,282
A. Frew	77.5	27.20	9,345
Manuel S. Gularte	39.5	26.98	9,072
Joe Garsino	10.0	26.96	8,099
Merrill Farms	41.3	26.83	7,464
Robert H. Martin	2.0	26.76	8,241
Petersen Bros.	17.8	26.68	8,686
V. Scattini & Son	96.2	26.68	8,653
Calif. Packing Corp.	61.0	26.57	7,509
C. Strehle & Son	25.0	26.51	7,651
Oji Bros.	60.0	26.49	7,475
Antonio F. Silveira	41.3	26.37	8,270
Bruce Church, Inc.	24.6	26.36	7,290
Volk & Jarrott	38.0	26.32	7,996
Arnold Morisoli	22.5	26.29	8,008
Manuel F. Rosa	14.0	26.28	9,035
Frick Bros.	148.0	26.25	7,959
Bruce Beeman	65.0	26.21	8,434
Dixon Dryer Co.	60.0	26.17	8,086
Richard Moore	118.0	26.11	7,332
Anselmo & Eldon W. Pura	39.9	26.02	7,524
Paul W. Reiff	80.0	25.99	8,530
Franscioni Griva & Son	43.8	25.98	8,411
Ed Thoming	80.0	25.95	8,143
Frank Giannoni	170.0	25.93	8,272
Curly Top Resistance Breeding Committee	1.0	25.91	7,022
Geo. R. Bubresko	5.0	25.84	8,380
T. W. Chung	55.9	25.83	7,305
Ira E. Hudson & Son	176.2	25.82	8,894
Tom G. Da Rosa	37.7	25.70	8,495
R. M. Baty	70.0	25.70	7,211
W. & R. Reiff*	7.0	25.65	7,926
Meek & Le Maitre	80.0	25.57	8,044
L. C. Houk	170.0	25.46	8,050
Kenner & Smith	54.7	25.39	8,895
Jim Fance	76.0	25.38	7,944
Bennie S. Black	40.8	25.37	8,254
R. Sargenti & Son	15.3	25.35	7,452
Gibson Bros.	21.0	25.34	7,425
L. M. Eveland	119.0	25.31	8,256
A. J. Perry	41.0	25.28	7,872
L. & W. Land Co.	23.0	25.27	7,500
Richard Bianco	15.8	25.16	7,288
P. L. Nunez	20.5	25.14	6,784
R. Sargenti & Son	17.6	25.11	6,745
Bellone & DelChiaro	17.6	25.03	7,573
Tony A. Sanchez	35.0	25.00	7,460

*Wesley and Randy Reiff grew these beets as a 4H Club project.

THE PESKY POCKET GOPHER

By WALTER E. HOWARD

Division of Zoology, University of California, Davis

THE barn owl's meal ticket — the common pocket gopher — can cause great economic loss to the farmer. The pocket gopher diverts irrigation water, thus accelerating erosion, and destroys plants that range in size from grasses to trees, including sugar beets. A gopher spends most of its life below ground. This abundant rodent is widely distributed over almost all of California. It is most common in the better soils where food is plentiful, such as alfalfa fields or irrigated pastures. Under such conditions populations of more than 50 adult gophers per acre may build up within a few years; on less favorable sites, such as foothill ranges, less than ten adults per acre may be present.

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ONE GOPHER destroyed 12 feet of sugar beet row in a few hours.

Mating between gophers is somewhat of a mystery, because adult individuals appear to live essentially a solitary existence and captive individuals are intolerant of each other, even when of opposite sexes. If two animals are put together, they will usually fight until the smaller one is killed. In alfalfa fields and other irrigated lands some breeding occurs throughout the year, but on foothill pasture lands reproduction is restricted to the green-forage season of winter and spring. The average litter size is about five. After the young mature some will disperse, traveling above ground to select a homesite elsewhere. A mature gopher that has become well established has a good chance of living to be two or three years of age.

Pocket gophers have many natural enemies. A pair of barn owls that have young to feed will catch from three to six gophers per day. To a lesser degree, hawks, herons, snakes, and many mammals also eat pocket gophers. They are particularly vulnerable to predators while young and also when irrigation or flood water forces them to leave the sanctuary of their tunnel systems.

44 *Drawn by G. Victor Morejohn*

THE POCKET GOPHER (Thomomys Bottae)

Pocket gophers are the chief burrowing rodent in California. Ground squirrels, even though their burrows are more conspicuous than those of gophers, actually dig relatively little and occupy old established systems. The four species of pocket gopher found in California probably turn over more soil than all the other 88 species of rodents put together. Gophers do not dig a burrow just for shelter and a place to rear their young, but they regularly excavate new soil in search of food and seldom venture more than a few inches outside of their burrow system. They establish many underground food caches of hay, seeds, roots, and bulbs. It is difficult to locate such food caches when excavating a gopher's burrow system, however, because many of them are sealed from the main runway with plugs of earth.

Pocket gophers remain active the year round, although their digging activity largely ceases during most of the summer period on soils that become hard and dry. Most burrow systems are located within the first foot or two of the ground surface, but occasionally a tunnel will extend downward several more feet. While digging a new tunnel, a gopher will often pack the excavated soil into an abandoned burrow rather than expose himself to predators by bringing the soil out on the surface of the ground.

Gophers are well adapted for digging. Because they dig so extensively, the nails of the forefeet are subject to great wear; and to compensate for this, the longest nails, the middle three on each front foot, grow about twice as fast as other nails. When hard soil or other objects are met with, the long incisors or "buck teeth" also aid in digging. These four teeth continue to grow at a phenomenal rate throughout the life of an individual. Each lower incisor grows about 14 inches a year and each upper about nine inches. If an animal does not wear them off by gnawing, he must grate the lowers and uppers together to keep the teeth from becoming too long. The incisor teeth project outside of the mouth cavity; thus a gopher can gnaw on roots or dig with these teeth without getting dirt in his mouth. Gophers have large external fur-lined cheek pouches. The front feet are

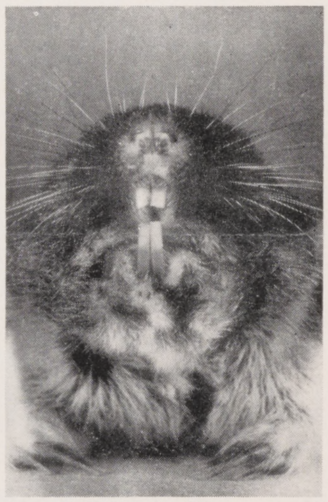


Photo by Nathan W. Cohen 45

THE GOPHER'S "Buck Teeth" grow at a phenomenal rate — 14 inches a year for lower incisors and 9 inches a year for the uppers.

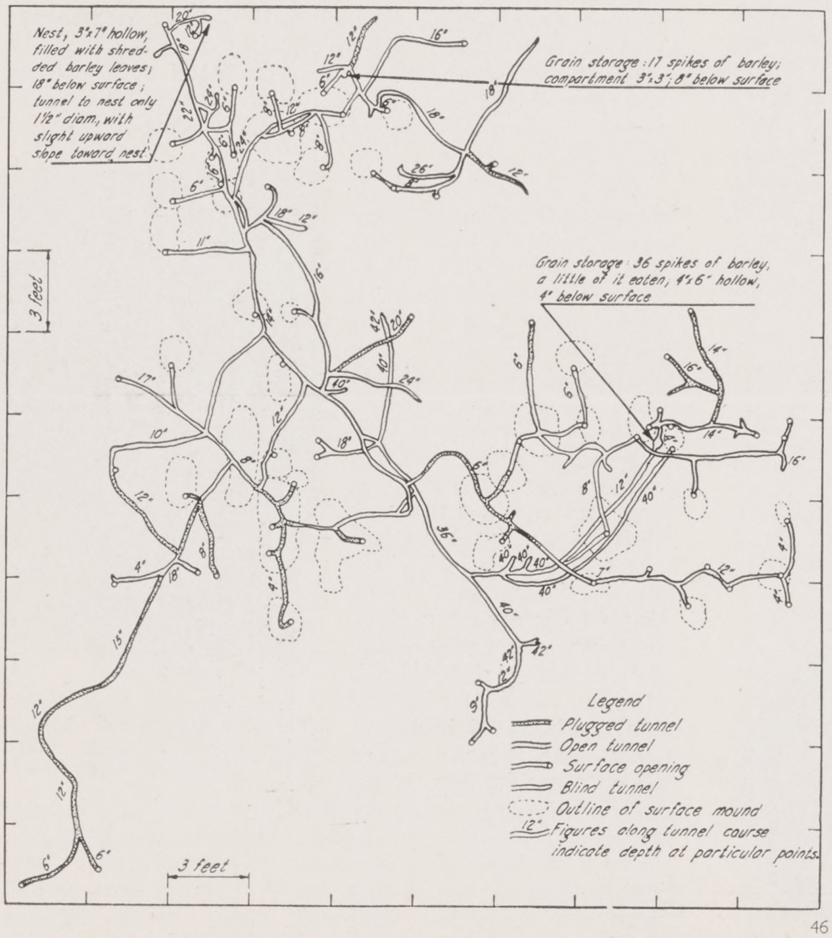
used to fill the pouches with food and nesting material. These pouches can be turned inside out by gophers in much the same manner as a man can pull out his pants pockets.

Since pocket gophers bring so much soil to the ground surface, many people have raised the question whether such burrowing activity improves soil conditions for plant growth by increasing aeration, water percolation, fertilization, and other cultivating activities. It appears, however, that plant roots and the myriad bacteria, protozoans, worms, crustaceans, arachnids, insects, and other small animals in the soil accomplish a more desirable form of soil conditioning. There appears to be little likelihood that pocket gophers will ever be cultured to improve the soil.

Sometimes water gets channeled down gopher burrows, and subsurface erosion ensues. After the tunnels become enlarged, the tops eventually cave in and deep gullies are formed. On both tilled and untilled lands in California many gullies have originated in this manner. It is important to note that this type of erosion may not be the result of close grazing, although after such a gully is formed it is sure to receive the accusing finger as an example of land abuse by grazing.

A variety of conditions determine the degree to which pocket gophers can become troublesome. It takes but one gopher to be very annoying, especially when the burrowing activity causes a ditchbank to wash out or irrigation water to be channeled where it is not wanted. One or more of them can be costly in orchards, vineyards, and many types of truck crops, and they can make a nervous wreck out of a home gardener. Damage becomes less evident, although considerable economic loss may still occur, in dense vegetation like irrigated pastures, alfalfa, or on range lands. Studies at the San Joaquin Experimental Range, Madera County, indicate that pocket gophers may reduce the amount of green feed available to livestock for forage even more than ground squirrels, because they are more numerous. On range lands pocket gophers will at times do serious damage to stands of perennials, especially after the annual forage becomes dry.

They spread Canada thistle and other plants by transporting root cuttings and seeds through their tunnels. Since they do not recover all of the food items which are stored, they may be responsible for spreading certain weedy species. How else can acorns get planted considerable distances uphill unless rodents or jays bury them on hillsides above the parent tree without later recovering them?



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THIS DRAWING of a typical gopher burrow is reproduced from Extension Circular 138, "CONTROL OF FIELD RODENTS IN CALIFORNIA" by Tracy I. Storer.

Pocket gophers are now probably the most destructive rodent pest in the State, since the number of ground squirrels has been so effectively reduced during the past few years by the use of recently developed poisons. It is often possible to eradicate pocket gophers from an area if dilligent control is practiced; however, since it is necessary to place the trap or poison bait inside an active burrow, the control of gophers requires much more time than does squirrel control. Poison baits, it has been shown, are more practical and effective than trapping — although less satisfactory to many people who want actually to see the dead gopher. Gassing gophers is not very successful. Unfortunately, better and more efficient methods of control are required to reduce labor costs. What is needed is the development of a persistent bait, which will remain toxic and acceptable to gophers for some time after it has been placed in a burrow, so that not only will it kill the gopher living in the system at the time the bait is placed in the runway but it will also poison any individuals which may later move into the same system and find some of the remaining uneaten bait.

MARBEET MIDGET NOW HARVESTS TWO-ROW BEDS

By E. F. BLACKWELDER
Blackwelder Mfg. Co., Rio Vista, Calif.

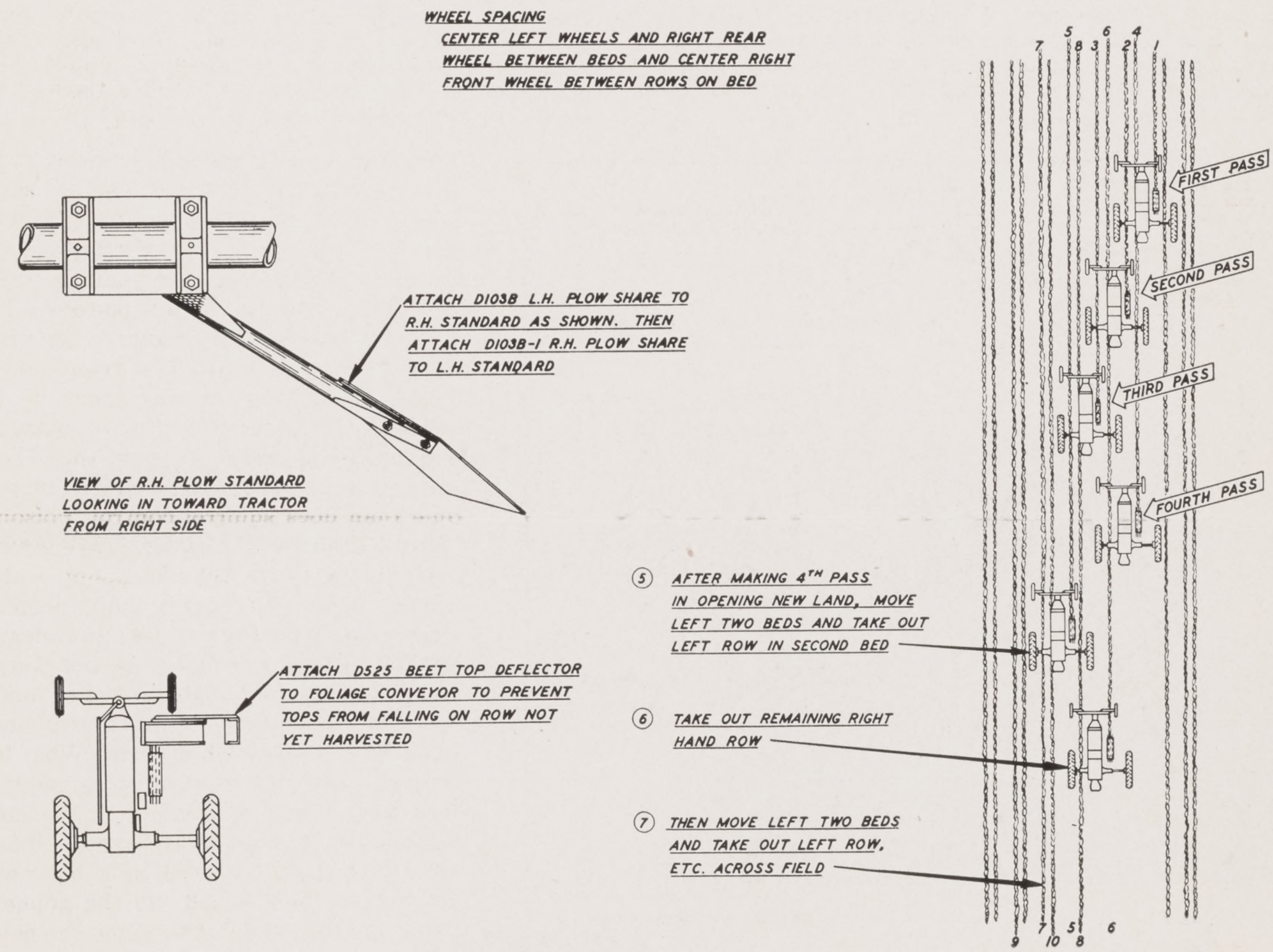
MANY sugar beet growers would have taken advantage of the economy and flexibility of the Marbeet Midget during the past harvest season if they had been able to operate the machine satisfactorily on two-row bed-planted beets. We believe that we have now worked out a satisfactory system for harvesting these popular two-row beds with the Marbeet Midget. We have done this first by making minor changes in the plows, and second by developing a harvesting system involving a minimum of interference between beet rows, tractor wheels, and elements of the harvester.

In an effort to save confusion and to present as clearly as possible the system of operating the harvester, we have made a drawing of the harvest system which is reproduced on this page. A little study of this drawing will make the harvest system clear, and enable the harvester operator to do a job which we believe, on the basis of considerable experience, is entirely comparable with the harvester's operation of evenly spaced rows.

Improvement on the 1952 Midget

Throughout 1951 and during the spring harvest of 1952 our engineers have spent a great deal of time in the field with a view toward eliminating certain objectionable features found in the earlier models of the midget harvester. Accordingly, we have incorporated a number of minor design changes, none of which is at all radical, but which all add up to make the harvester operation generally more satisfactory.

We sincerely thank our many friends who have cooperated in the field trials which have helped us to make these improvements in the 1952 model "D" harvester.



PROCEDURE FOR HARVESTING TWO-ROW BED PLANTING WITH "MARBEET" MIDGET HARVESTER

DAVIS 4-H BOY WINS CALF AWARD

Last March, during the Grand National Livestock Exposition held at the Cow Palace in San Francisco, Marden Wilber, Jr. of Davis, a winner in the "Calf Scramble," was sponsored by the Spreckels Sugar Company. Marden, 15 years old, is the son of Marden Wilber Sr., a long-time beet grower. A sophomore at Davis High School, he went into his calf feeding project enthusiastically, industriously, and conscientiously. His Aberdeen Angus calf was purchased from Mr. Dole E. Borror of Gerber, California. At the time of purchase, the calf weighed 650 pounds and cost $244.00. The difference between the purchase price and the Company award was made up by Marden himself.

April seventh this year, the Angus steer was shown at the Cow Palace. The sponsored animal event is judged on the Danish system and Marden's steer placed "prime," the highest classification possible under the system. In the sale after the show, the management of the Clift and Plaza Hotels bought Marden's black animal at 42c per pound, the second highest price received for an animal in this group of steers. The sale weight was 1,142 pounds.

Marden belongs to the Solano County 4-H Club even though he attends school in Yolo County. He plans to attend either California Polytechnic at San Luis Obispo or Fresno State. He is certain that when all schooling is behind him, farming with emphasis upon livestock production will be his occupation.

Marden's achievement with his project and his eagerness and interest during the entire feeding period is ample reward to the Company for its participation in the Calf Sponsorship Program.

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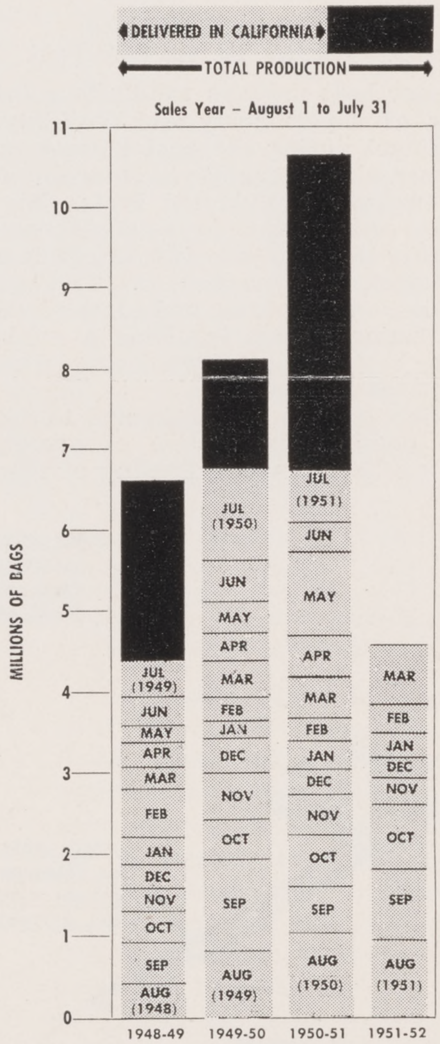
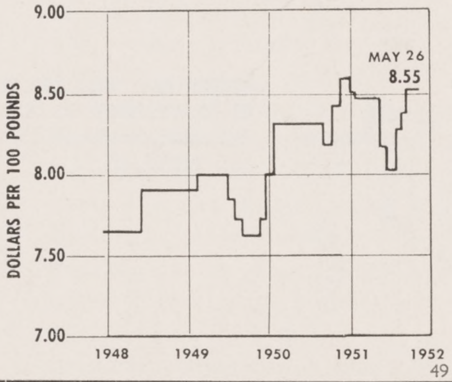
GUY D. MANUEL congratulates Marden Wilber on the sale of his steer.

PRODUCTION AND DELIVERIES OF BEET SUGAR IN CALIFORNIA



QUOTED PRICE OF BEET GRANULATED SUGAR

In 100 Lb. Paper Bags, F.O.B. San Francisco



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The SPRECKELS SUGAR BEET BULLETIN is issued bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.
Mention of specific methods, devices or implements does not constitute an endorsement by the Company.
All photographs by the editor unless otherwise indicated.
AUSTIN ARMER, Editor 600 California Fruit Building Sacramento, California

SPRECKELS SUGAR BEET BULLETIN

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SOIL MANAGEMENT

is an old art — a new science. Methods and materials for achieving and maintaining

GOOD TEXTURE
HIGH FERTILITY
MOISTURE CAPACITY

are subjects of concern to all who grow sugar beets. See pages 26 and 27

Vol. 16 JULY - AUGUST, 1952 No. 4
PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

SYNTHETIC SOIL CONDITIONERS

By GEOFFREY B. BODMAN and ROBERT M. HAGAN*

SOIL CONDITIONERS available commercially, including CRD-186 and CRD-189—Krilium—are synthetic organic materials. They consist of complex, long chain molecules containing hundreds of atoms each. They are light colored, water soluble and hygroscopic—tending to absorb moisture.

The chain-like molecules of these new conditioners are thought to hold together the clay particles and thus preserve the clusters of soil particles—or aggregates—typical of soils with good structures

These materials are said to produce aggregation in much the same way as certain components of natural soil humus which are formed in small quantities during the decomposition of plant residues, manures, and other organic materials. In contrast to the natural organic matter, CRD-186 and CRD-189 are reported to resist decomposition by soil organisms.

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SOIL CONDITIONERS WILL NOT convert a field of adobe clods into one of fluffy loam, as implied in this illustration and in some magazines and newspapers. But these new compounds reflect a basic understanding of soil structure and may become an important aid to soil management.

The influence of CRD-186 upon the formation of soil aggregates and their resistance to dispersion by water were studied for nine different California soil series. The treated soils received additions of the synthetic compound at the rate of .1% by weight. The conditioners were thoroughly mixed with the air-dry soils, and the mixtures then sprinkled with water before again being mixed. Except for the addition of conditioners, the untreated soils were prepared in the same way as the treated.

To examine the effect of exposure to weather, the treated and the untreated soils were placed in vertical, open-ended, metal cylinders of about 0.8 square foot cross-sectional area. The soil columns were approximately eight inches deep and made contact with the undisturbed subsoil of a field.

After one week the soils were sampled and air-dried in the laboratory before analysis. The addition of 0.1% CRD-186 brought about a significant increase in content of water-stable aggregates greater than one-fourth millimeter in average diameter. The greatest absolute increases in aggregation were observed in the silt loam, loam and sandy loam soils. These medium and coarser textured soils displayed a low initial aggregation. The least pronounced effect was observed in the finer-textured soils which, without treatment, already possessed more than 65% by weight of water-stable aggregates.

To study the effect on treated soil of exposure to the influences of soil moisture, weather, and micro-organisms, five of the nine soil types were exposed out of doors in Berkeley for 18 weeks between December 12, 1951 and April 18, 1952. During this exposure period, 23″ of rain were recorded at the weather station one-half mile away. Between storms there were several rainless periods when the surfaces of the soils became partly dried.

Samples of the soils were collected for aggregate analysis 18 weeks after exposure and represented the entire 8-inch columns.

Except for the Arbuckle sandy loam, all of the untreated soils were found to contain somewhat higher quantities of water-stable aggregates at the end of the four months than at the beginning. Of the treated soils all but Stockton clay showed a greater aggregation than was produced by the weather alone in the untreated soils.

The influence of the added synthetic soil conditioner persisted during 18 weeks with only slight gains and losses in the measured aggregation.

Upon wetting and drying, CRD-186-treated soils tend to break up into smaller blocks separated by finer cracks than untreated soils. In exposed cylinders at Berkeley the treated soils cracked, forming many small lumps when dried. The untreated soils showed fewer cracks and separated from the container walls in massive lumps.

In a preliminary study on a recently leveled field in Glenn County, CRD-189 was applied dry and cultivated in. The field was then sown to Sudan grass. After several flood irrigations in strip checks, the cracking pattern of the surface soil was examined. The soil of the treated plots cracked to give an average of 36.1 blocks per square foot while the untreated had 19.9. Similar observations have been made in connection with studies on synthetic conditioners to improve seedling emergence.

In the Berkeley experiments, no measurements were made of rates of infiltration into the treated

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*Geoffrey B. Bodman is Professor of Soil Physics, University of California College of Agriculture, Berkeley.

Robert M. Hagan is Assistant Professor of Irrigation, University of California, Davis.

Milton D. Miller, University of California College of Agriculture Farm Advisor, Glenn County, cooperated in the field studies reported above.

This article was reprinted from the September, 1952 issue of CALIFORNIA AGRICULTURE. It is a condensation of a more detailed report on the subject of synthetic soil conditioners which is available without cost by addressing the Office of Agricultural Publications, 22 Giannini Hall, University of California, Berkeley 4, California.

and untreated soils, but rain water was often observed to remain longer on the surface of the untreated soils.

When water is applied to a soil, the pore spaces for a short time may become almost filled to the depth wetted. Within a few days in well-drained soils, some of this water will move downward and perhaps horizontally. The amount of water retained by the soil after drainage has occurred is called the field capacity. Plants can not extract all of this moisture for their normal functioning, and wilting occurs at a moisture content characteristic of the soil which is called the wilting point. For practical purposes, the difference between field capacity and wilting point is the available water.

The field capacities of soils can be estimated by standard laboratory determinations called the moisture equivalent and one-third atmosphere percentage. The wilting points may be obtained directly by growing small sunflower plants in the soils or estimated indirectly by what is called the fifteen-atmosphere percentage.

By measuring the effect of soil conditioners on these soil-moisture characteristics, their influence upon the total soil moisture available to plants can be evaluated.

Moisture equivalents and sunflower wilting points were determined for Yolo soils ranging in texture from loamy sand to clay. CRD-189 at the rate of 0.1% by weight was mixed with air-dry soil, the mixture moistened, and the moisture equivalents run without preliminary air-drying of the treated soil. Addition of the chemical compound produced no distinct changes in moisture equivalents or wilting points and hence no increase in available water. In fact, where the loam was wetted and dried three times before the determination, the moisture equivalent and the available water were decreased.

The water-retention characteristic of CRD-186 treated soils of four other soil series were investigated, using apparatus which permitted determination of the amount of water held under a number of pressures, including one-third and fifteen-atmospheres. The soils were air-dried after incorporating the synthetic conditioner. The one-third atmosphere percentage—approximate field capacity—of the conditioned soils tended to be lower, particularly with the Sweeney clay loam. The fifteen-atmosphere percentage—approximate wilting point—was little affected. These measurements indicate that the addition of 0.1% CRD-186 does not increase the available water but may diminish it somewhat by reducing the amount of water held after drainage.

In more detailed studies, CRD-186 and CRD-189 were added to five soils at various rates. Use of as little as 0.02% conditioner by weight caused some decreases in moisture equivalent. Additions of as much as .4% CRD-189 gave small increases in moisture equivalent. It is doubtful, however, if the slight variations observed are of practical importance.

Although CRD-186 and CRD-189 do not directly

Continued on page 32

GREENHOUSE EXPERIMENTS WITH KRILIUM

By DAVID RIRIE

Junior Agronomist, University of California, Davis

IN RECENT MONTHS soil conditioners of various types have been publicized rather widely. Among these, "Krilium," a product of the Monsanto Chemical Co., has probably received the most attention. The claims for this resin-like material have often been spectacular. Among the beneficial effects on the soil attributed to it have been stabilization of aggregates, better drainage, increased aeration, retarded water loss by evaporation, easier workability, prevention of crusting, etc.

Since crusting is often a serious drawback in obtaining good stands with sugar beets and other crops, it was felt that such a material was worth investigation. At first a greenhouse experiment was set up in which Krilium at different rates was mixed with soil and used to cover beets as they were seeded. The soil was then wet thoroughly and allowed to dry out as the beets were emerging. In this test Krilium had very little effect upon the number of emerging seedlings or upon the rate of emergence.

A second test was set up in the greenhouse using a different technique There were eight treatments in all. Three rates of "Krilium 186" were mixed thoroughly with soil in separate partitions of the flats. Comparable rates were banded 2 inches wide and worked 1 inch deep into the soil to make three more treatments. All of the flats were then moistened to field capacity and left fallow for two weeks. The soil was then cultivated with a plot marker so that no crust was left over any of the flats. Seeds were then planted in each partition at the rate of 40 per 20 inches of row. The eighth treatment was placed as in the first experiment, i. e., dry soil mixed with "Krilium" was used to cover the seeds. All of the flats were again irrigated and left uncovered.

DR. RIRIE demonstrates how crusting was prevented by KRILIUM, formulation No. 186. The three treatments shown above are:

Center — Yolo clay loam, no treatment — 24 seedlings from 40 seed units.

Right — Same soil mixed with 0.2% Krilium 186-42 seedlings from 40 seed units.

Left — Same soil, with a 2" band of 0.2% Krilium 186-26 seedings from 40 seed units.

As the soils dried out, it was observed that the surface of the untreated soil became cracked and crusted whereas the treated soils had few cracks and less crusting. At the termination of the test the

Continued on page 32

SOME PRACTICAL OBSERVATIONS ON SOIL MANAGEMENT

By HENRY SEVIER
Superintendent of Ranches
Spreckels Sugar Company, Spreckels, Calif.

AS A NEWCOMER to the Salinas Valley a few years ago the writer was greatly surprised—even shocked—to see that fields were sometimes worked while quite wet. Such practices in the heavy lands of the Sacramento Valley would have invariably produced dire results; in many cases the soil had practically been "killed" for two or three years following such treatment. Further observation showed that in the case of such crops as broccoli, celery, cauliflower and, even lettuce, harvesting was sometimes done under such wet conditions that trucks had to be pulled through the fields by heavy tractors, the truck frames actually dragging like sleds over the wet soil. A terrifying spectacle!

And yet, in the following Spring the soil worked well, ridges were put up with few clods in evidence, and formed excellent beds for the new plantings. In the growing crops themselves no bad results from this rough treatment were apparent. There must be a reason, or reasons.

To this observer the reasons are these:

1—The tremendous amount of vegetable refuse which is put back into the soil.

The refuse of the crops mentioned above, as well as that of radish (for seed) and sugar beet tops, returns many tons of vegetable matter to the soil. Sugar beet tops are not usually pastured in the area adjacent to Salinas, so they, too, contribute humus to the soil. This is especially true of Spreckels Ranch No. 1.

2—The general use of cover crops of vetch or barley.

Some growers who specialize in lettuce production follow two seasons of lettuce (four crops) with an August or September planting of vetch which is worked under in the Spring by disking and deep chiseling. Plows are not generally used to put cover crops under.

3—The rather general use of animal manure—up to ten tons per acre.

Manure seems to provide more benefits than its equivalent in chemical fertilizers. It creates good tilth and crops thrive on it.

4—The use of lime and gypsum as soil conditioners.

The Spreckels Sugar Company furnishes waste factory lime to beet-growers without charge and as much as 25,000 tons has been so distributed in a single year. In addition large quantities have been sold to fertilizer dealers and directly to non beet-growers.

On Spreckels Ranch No. 2 near Soledad, and on Ranch No. 11, east of Greenfield, soil improvement practices include the incorporation of vegetable wastes into the soil and the use of animal manure. Sugar beet tops are usually pastured; this practice adds animal manure to the soil and, since the soil is lighter than in the Salinas area, there is little compacting of the soil from pasturing. Cover crops are of barley, as a rule.

On both of these ranches, as well as on Ranch No. 3, near King City, alfalfa plays an important, and increasing part in the soil improvement program.

It would be a mistake to conclude from the above that, in the opinion of the writer, or of the growers, it is desirable to abuse the soil by working it while it is wet. However, to get the work done in time, to harvest certain crops and to get specialty crops to the market when favorable prices prevail, it sometimes becomes necessary to do so. That the Salinas Valley grower tries to avoid these abuses is evidenced by the fact that often as many as four tractors may be seen preparing a field of only ten acres in order that the work may be done at the optimum time. The important thing to note is that land which has been well treated in other respects may repay its operator by being able to withstand occasional abuse with a minimum of damage.

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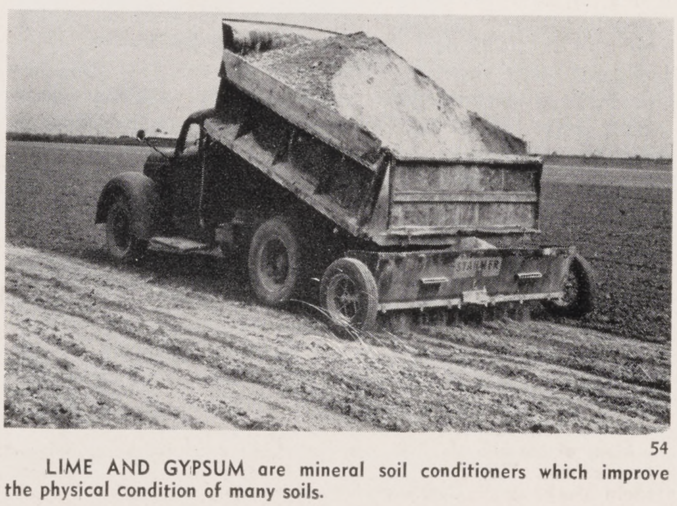
COVER CROPS worked into the soil by disking and deep chiselling contribute to good soil structure.



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LIME AND GYPSUM are mineral soil conditioners which improve the physical condition of many soils.

UNIFORMITY OF STANDS IMPROVES AFTER THINNING

By AUSTIN ARMER

Agricultural Engineer, Spreckels Sugar Company

THE INTRODUCTION of mechanical thinning and its large scale acceptance in 1952 have focused attention on the characteristics of sugar beet stands, particularly in reference to the numbers of double plants and clumps.

Perhaps the greatest indictment of mechanical thinning has been the non-uniformity of seedling stands for which it is responsible. By its very nature mechanical thinning leaves a large number of seedling clumps, although this situation has been considerable improved by the custom of a second or third pass of the thinning machine, using a large number of narrow cuts with the object of splitting the original blocks and converting at least a part of the clumps into singles and doubles.

Observations of mechanically thinned fields have revealed an unexpected uniformity of stand, quite out of proportion to what might be expected from the more or less random reduction offered by mechanical thinning methods. These observations inspired some investigations to determine why mechanically thinned stands appear to improve in uniformity after thinning. Counts in both hand and mechanically thinned fields were made at intervals following the date of thinning. The results revealed a situation whereby the forces of nature appear to work on behalf of the sugar beet grower.

In order to make the stand counts consistent, the following definitions were established:

1.) A "Single" is a beet plant whose tap-root center is at least 4 inches from the tap-root center of its nearest neighboring plant.
2.) A "Double" is a pair of beet plants, regardless of relative size, whose tap-root centers are less than 4 inches apart.
3.) A "Clump" is a cluster containing three or more beet plants, whose extreme tap-root centers are less than 4 inches apart.

Each time a stand count was made, the number of clumps had shown marked reduction and the number of singles had increased significantly. Furthermore, as the season progressed some double seedlings spread apart so as to become two substantial single beets, while other doubles became large single beets with an adjoining "nubbin"—recoverable by mechanical harvest.

It was particularly revealing to study some of the hand-thinned fields. While many of them—the majority, in fact—contained principally single plants, others contained startling numbers of clumps—in one case more than were found in any machine thinned field.

PHOTOGRAPHS AND FIGURES DEMONSTRATE REDUCTION OF CLUMPS AND INCREASE OF SINGLES AFTER MECHANICAL THINNING

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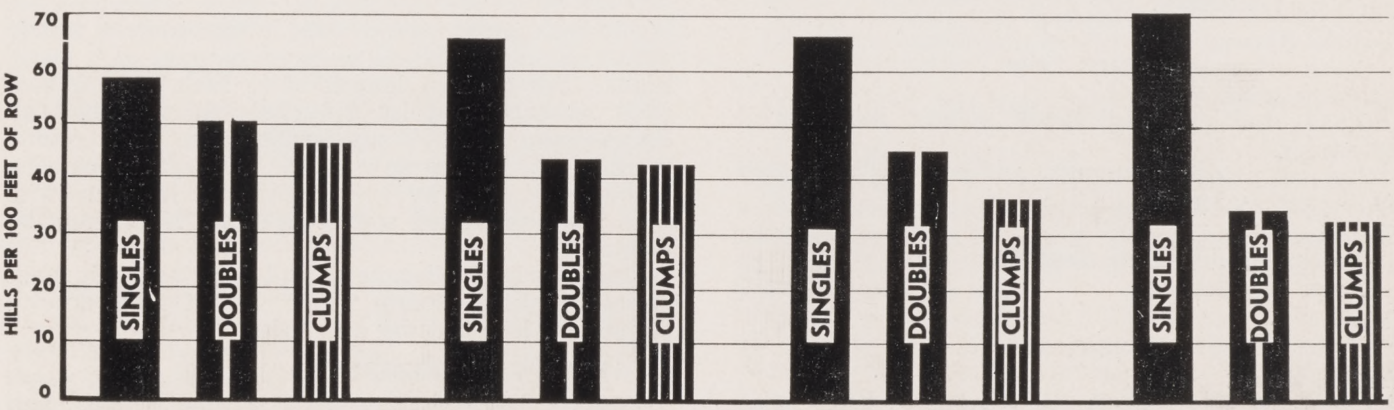

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3 DAYS AFTER THINNING
Hills per 100 feet of row—157.0.
Single plants, 58.7 (38.5%).
Many of the hills (30.2%) contain clumps. The clump in the photo above has 9 seedlings.

13 DAYS AFTER THINNING
Hills per 100 feet of row—152.7.
Single plants, 66.0 (43.2%).
Clumps are now losing the weaker plants. The photo above shows two plants dominating the hill.

28 DAYS AFTER THINNING
Hills per 100 feet of row—149.3.
Single plants, 66.3 (44.4%).
Two plants now remain. The smaller one may die, or may survive as a small beet.

60 DAYS AFTER THINNING
Hills per 100 feet of row—138.7.
Single plants, 70.7 (51.0%).
The small beet has survived, and will be large enough to recover by mechanical harvest.

SUGAR BEET HARVESTER OVERHAUL AND MAINTENANCE

By JULIAN WILLIAMS and JOHN NIELSEN*

THE MECHANICAL harvest of sugar beets is now so generally practiced that employment of hand labor has become the exception to the rule and is largely limited to occasions when conditions resulting from adverse weather make use of the harvester impractical.

As a grower you are interested in reducing the per ton harvest cost to the lowest possible level and if this is to be accomplished, harvest equipment must be kept in good mechanical condition.

The following outline of the various steps involved in overhaul of the Marbeet harvester is offered with the hope that it may help grower-owners, particularly those with limited experience, to do a better overhaul job and realize the resulting benefits.

1. ENGINE

Have on hand the manufacturer's manual of instructions for your power unit.

Check compression. If under 60 lbs. on any or all cylinders, remove head and check valves, rings, etc.

If engine has been unprotected in weather it may be advisable to pull head and examine for rust on cylinder walls and stuck valves.

Valves

Check clearance.

Cooling System

Flush.

Clean out radiator core if clogged with dirt and trash. (Check this frequently during operation).

Check fan, fan belt and belt tension.

Air Cleaner

Check for loose connections between breather and carburetor.

Clean and refill cleaner with oil.

Watch this closely during operation and repeat often as necessary.

Ignition System

Clean or replace spark plugs.

Check gaps.

Clean magneto and check points; lubricate if necessary.

Suggest painting magneto and wires with a good insulating material.

Crankcase

Change oil and filter element.

Clean breather cap.

Clutch

Check for correct engagement.

Engine Mount

Check for cracks. To tighten drive belts raise motor at all four corners as necessary to maintain pulley alignment.

*Julian Williams is District Engineer, and John Nielsen Assistant District Engineer, Spreckels Sugar Company, Sacramento.

2. HYDRAULIC SYSTEM

Drain old oil and flush.

Examine cylinder barrels for rust and pitting. If the condition is not severe, these may be cleaned up by honing.

Replace piston cups or "O" rings if condition is at all doubtful.

Lift machine with pump. If sluggish have pump overhauled by a competent person or concern. It may be good economy to have a replacement unit on hand, particularly if you have a large acreage.

Replace waste in breather cap.

Refill with clean oil.

3. PITMAN AND TOPPING ASSEMBLY

Check pitman bearing and pitman rod for excessive wear, and replace if necessary. Be sure drive pulleys are aligned.

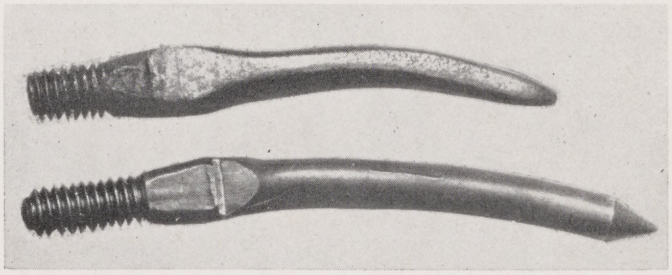
Check all wearing parts on sickle assembly and replace if necessary. Be sure to have 4 sickle head wear plates to take wear at that point. Check sickle support bar to see that it is straight. See that sickle bar is "in time".

Topping knives should have sharp blades and ledger plates.

Straighten blades if necessary and turn pickup wheel over to see that spikes clear blades.

4. PICKUP WHEELS

Straighten or replace spikes. Spikes less than 2¾ inches long or worn thin should be replaced. Do not try to straighten spikes with a hammer. A brittle spike can break and do as much damage as a pistol bullet. Use a short length of ½ inch pipe or tool such as developed by Spreckels Sugar Company Sacramento Yard. Considerable time and trouble is saved by using new nuts. Old spikes can be quickly removed by giving the nut a hard twist with a long-handled socket wrench. Nuts must be tight.



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The worn spike (upper) has outlived its useful life. It should be replaced by a new one.

Check wheel alignment and bearings. Suggest counter-sinking pickup wheel shaft for set screws to prevent hub turning on shaft.

5. STRIPPER ASSEMBLY

It is not necessary to replace stripper knives even though badly worn. Blades may be re-sharpened and edges beveled to clear spikes. New blades or tips may be welded on if wear is excessive. It is usually advisable to change springs when knives are reinstalled.

The spike-straightening tool used by the Spreckels Service Crew at Sacramento. That little round shield above the two hexagon nuts is not a stop to rest against the spike tip. It is a shield for the user's protection against a flying piece of brittle spike.

6. FILTER ASSEMBLY

Clean and examine filter roll pans for cracks which can be repaired with low hydrogen arc rod. Hard-facing wearing surfaces will greatly increase the life of a filter roll. Check bearings and align sheaves. Driving V-belt should be replaced if it appears questionable.

7. ELEVATOR

Check elevator frame alignment. Watch for worn spots where potato chain may have been rubbing. Worn links should be replaced, as a broken potato chain in the field means lost time. See that elevator drive sprockets (or sheaves) are in line. Examine clutch throw-out yoke and clutch dogs for excessive wear. Safety set collar on end of clutch shaft must be secure.

8. FOLIAGE CONVEYOR

Trash belt and lacing should be in good condition. Check belt pulleys for alignment and looseness on shafts. See that belt scraper is in shape to clean loose dirt from under side of belt. Trash belt should be checked frequently during operation for dirt accumulation and misalignment of pulleys.

9. MAIN FRAME AND DRIVES

Examine entire frame and hitch for cracks. Reinforce at these critical points. Check all belt and chain drives for alignment, loose bearings, etc. See that the line shaft is straight — bearings can be shimmed to align shaft.

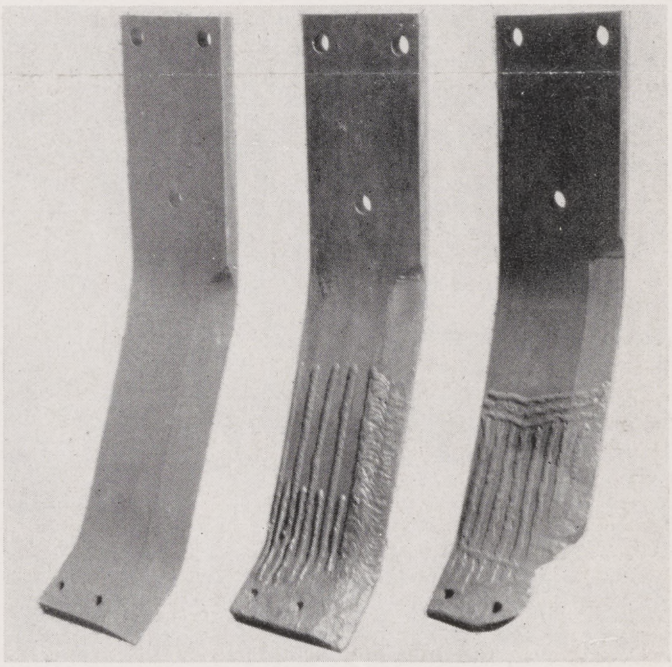
10. GROUND WHEELS

Rubber tire wheels: Be sure bearings are **tight** on axle. A safety set collar should be on each side of wheel to prevent bearing from working loose.

Steel wheels: Check bushings for excessive wear. Grease frequently during operation. Examine rims for cracks. Suggest reinforcing each side of rim by welding in light flat bar rolled to wheel circumference.

11. PLOWS

Plows and standards should be hard-faced if used in abrasive soil. Most important is not to allow plows to become excessively worn during operation before changing or re-hard-facing. Plow standards, particularly the 2-row center plow standard, will give trouble if bent or sprung.



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1. A new Marbeet front plow, before hardfacing.
2. The same plow, properly hardfaced. Ranite Type "C," overlaid with Rantung, is applied uniformly on all direct wearing surfaces (leading edge, bottom corner and lower end, both sides), while the vertical stringer beads of Ranite prevent secondary abrasion.
3. This plow had been properly hardfaced, but was left in service so long that economical rebuilding is impossible.

12. LUBRICATION

Sealed ball bearings are factory-packed with grease and should normally run through a season's work without lubrication. However, under the dusty conditions in which the machine operates, it is the general practice to install greased fittings and lubricate as often as seems necessary. Use a hand gun and do not try to force it. Too much pressure may blow out the seal.

It will be necessary many times during the overhaul job to decide whether the existing worn part should be replaced, or whether it may be safely left and its full value realized. If the actual time of failure of the part cannot be closely estimated, or if appreciable time will be lost by emergency replacement, it will be generally advisable to install a new part and save the worn one for future emergency use.

SOIL CONDITIONERS

Continued from page 27

increase the available water held by a given quantity of soil, such conditioners in some soils may indirectly enlarge the supply of water available to the plants. If their use aids the infiltration of water into the soil or encourages deeper and more extensive plant root systems, plants could extract water from a greater volume of soil. This would permit less frequent irrigation and more efficient water use. However, under the conditions of the Glenn County plots, use of CRD-189 did not improve infiltration rates and so did not permit the storage of additional moisture.

Studies in progress at the University of California on how synthetic soil conditioners may affect plant growth have not been completed.

The use of CRD-186 and CRD-189 to reduce soil crusting and improve seedling emergence is under investigation by several departments including Agronomy, Vegetable Crops, Soils, and Floriculture and Ornamental Horticulture. To date no conclusive results have been obtained.

KRILIUM EXPERIMENTS

Continued from page 27

following data were tabulated and statistically analyzed: mean emergence period, total stand, and average dry weight per seedling. The results are shown in Table 1.

Table 1. The effect of Krilium on emerging sugar beet seedlings.

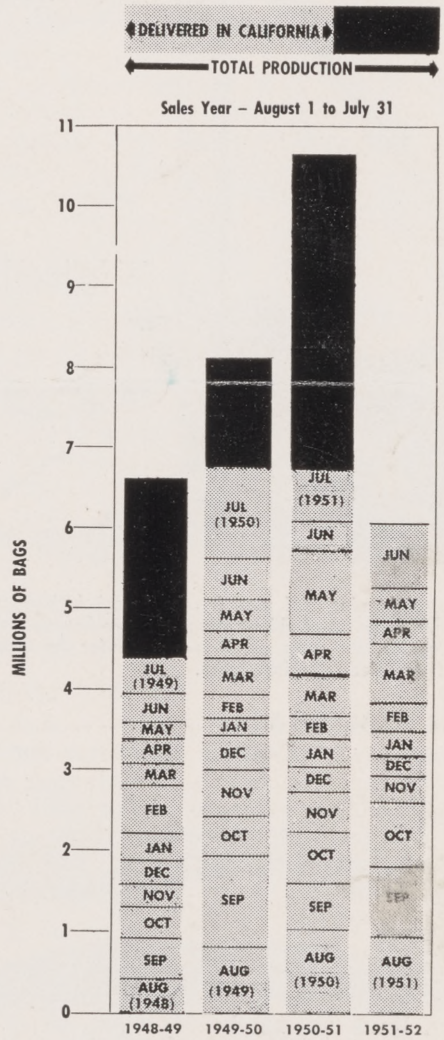
	Mean Emergency Period (hours)	Stand per 100 Seedlings planted	Ave. dry wt. (mgms)
Krilium Treated (2 wks. before seeding)	108*	108*	61
Krilium Treated (as dry mix)	120	80	55
Untreated	118	84	55

*Indicates significance at 19:1 odds.

It can be seen from the table that the mean emergence time was low for all treatments, or barely over four days. The seedlings in the soil that was treated before seeding emerged almost ½ day earlier on the average than those from untreated soil. It is possible that such a difference might be greater under conditions when emergence would take longer. There was an increase in stand of about 25 per cent in the pre-treated soil. It also appears that the seedlings from pre-treated soil may be more vigorous.

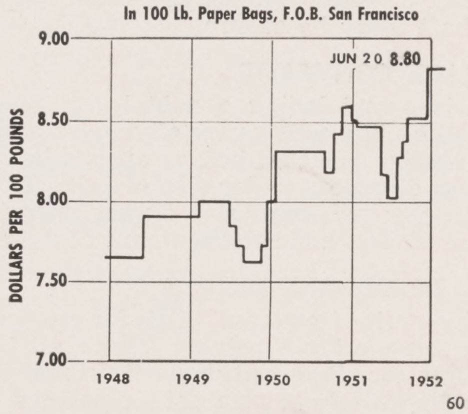
It was interesting to note that there was no significant difference among rates of application or between the banded placement and the completely incorporated placement. This is encouraging since the cost of this material would demand that a low rate, banded type of application be used.

PRODUCTION AND DELIVERIES OF BEET SUGAR IN CALIFORNIA



QUOTED PRICE OF BEET GRANULATED SUGAR

In 100 Lb. Paper Bags, F.O.B. San Francisco



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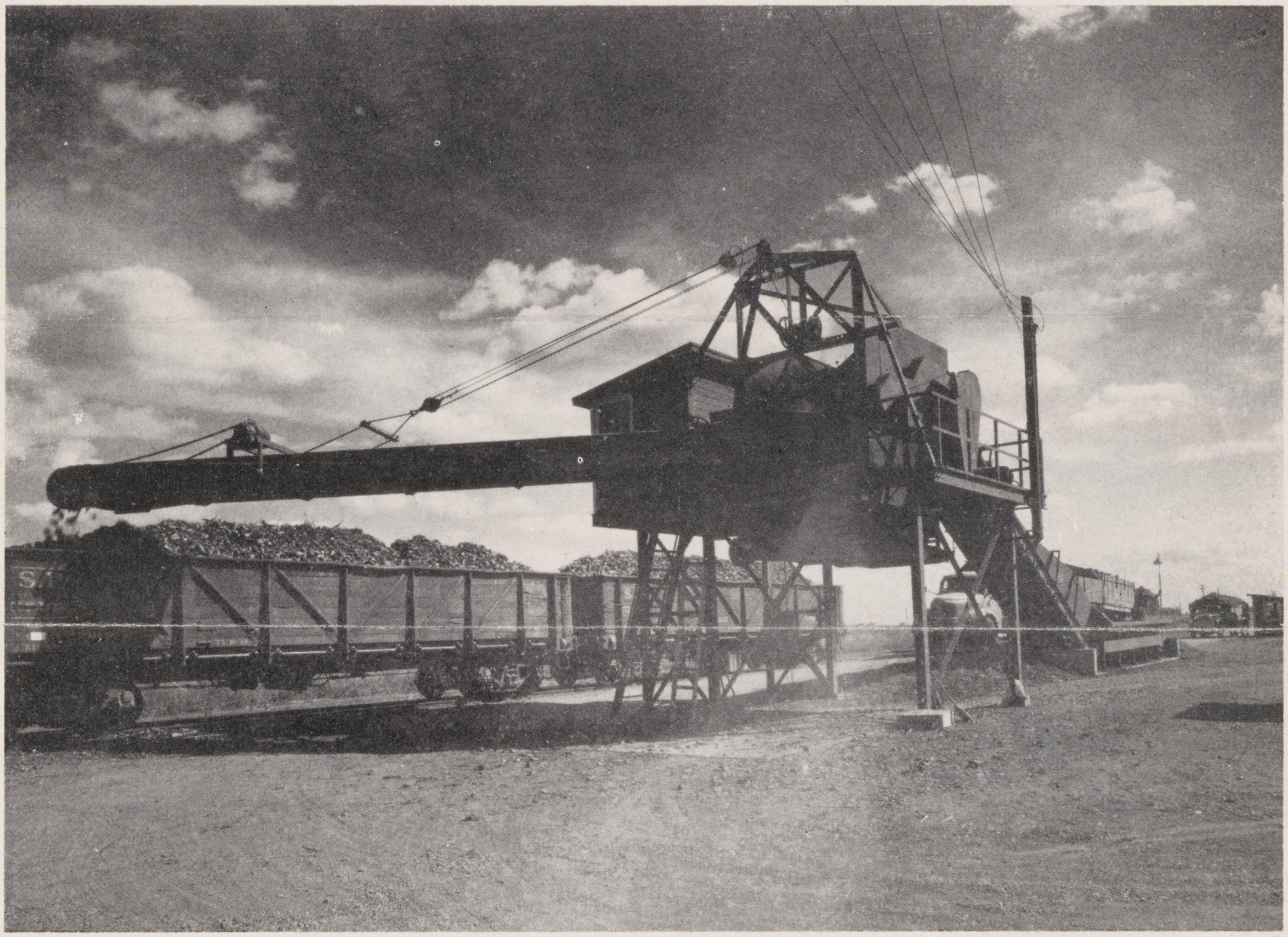
The SPRECKELS SUGAR BEET BULLETIN is issued bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.
Mention of specific methods, devices or implements does not constitute an endorsement by the Company.
All photographs by the editor unless otherwise indicated.
AUSTIN ARMER, Editor 600 California Fruit Building Sacramento, California

SPRECKELS SUGAR BEET BULLETIN



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NEW RECEIVING STATIONS

Are part of Spreckels Sugar Company's modernization program.

IMPROVED RECEIVING FACILITIES

INCREASED FACTORY CAPACITY

PULP DRYING AND STORAGE

all contributed to efficient sugar processing and grower service.

Vol. 16 SEPTEMBER - OCTOBER, 1952 No. 5
PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

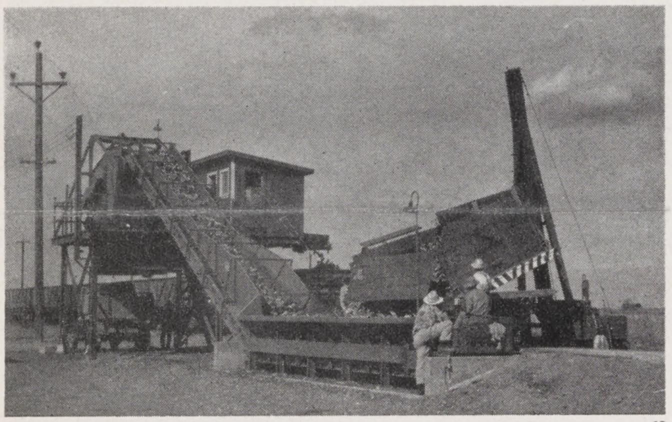
NEW BEET RECEIVING STATIONS WILL SERVE SPRECKELS GROWERS

By AUSTIN ARMER

Agricultural Engineer, Spreckels Sugar Company

IN KEEPING with the Company's policy of maintaining maximum grower service, two new beet receiving stations have been put into operation for the 1952 campaign. Meanwhile, other stations have been modernized and facilities provided for the long distance shipping of beets by either transport truck or railroad.

At Sucro, near Dixon, and at Josephine, near Meridian, two entirely new receiving stations have been built. These stations have 40-foot scale decks which will accommodate the largest of growers' trucks (the scales have a capacity of 40 tons). Receiving hoppers of these new installations are placed at a low elevations so that loaded trucks have almost no climb to reach the unloading platform.



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NEW BEET DUMP at Sucro, Solano County, serves the Dixon district.

The new beet dumps have improved cleaning screens, made necessary by mechanical harvest with its accompanying tendency to deliver large quantities of trash.

Accuracy of dirt weight recording is insured by a two-way intercommunicating system so that the weighmaster not only distinctly hears the dirt weight transmitted by the sample man, but instantly relays the dirt weight back to the sample man as a check.

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THE JOSEPHINE beet dump was installed to accommodate this highly productive area.

Another contribution by the Spreckels Sugar Company Agricultural Engineering Staff is the "anti-backlash" car puller winch. A self-actuating brake on the car puller cable drum prevents the latter from unwinding and maintains the cable under tension at all times.

Receiving hoppers are 26 feet long—adequate to accommodate the largest beet bed. Hydraulic truck hoists, pioneered by the Spreckels Sugar Company, make possible very accurate control of truck dumping so that it is possible to keep the feeder belt full throughout the dumping period.

In order to improve the efficiency of beet pilers used as receiving stations, the latter have been equipped with hydraulic truck hoists. Improvements such as this contribute to faster handling of growers' trucks at the Company's receiving stations.

NEW PULP DRIER AT WOODLAND FACTORY

By F. H. BALLOU, JR.

Chief Engineer, Spreckels Sugar Company

SPRECKELS SUGAR COMPANY is investing about three quarters of a million dollars in new buildings and equipment to produce molasses dried beet pulp from the wet pulp remaining from the processing of 1,800 tons of beets per day at the Woodland Factory. In addition to producing this dried pulp the Woodland Factory will continue to put pulp from the balance of Woodland's total beet slice of about 3,100 tons per day into the wet pulp silo.

Molasses will be added to the pulp before drying so as to produce "molasses dried beet pulp". The molasses will be metered and added continuously to the pressed wet pulp so as to give a uniform dried pulp product.

When beet pulp is dried, it curls. These curls interlock with each other, thus preventing dried pulp

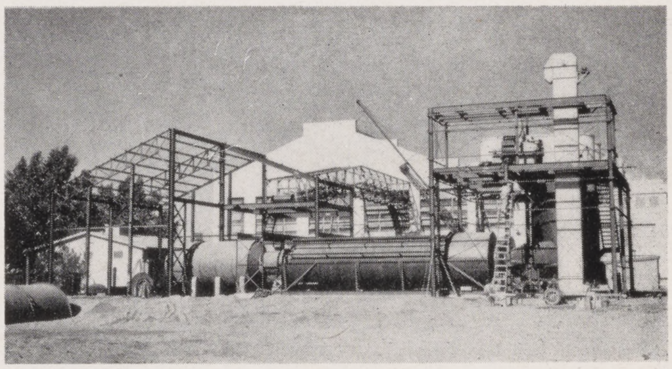

Photo by Fred Eis 64

PULP DRIERS during construction. The cylinder left of center is one of the furnaces. The cylinder in center of picture is a drier.

from being at all free flowing. Hence, it is relatively difficult to store, handle, ship, unload and feed in bulk form. At Woodland, the molasses dried beet pulp will be passed through a flaker, which will break off most of the curls and thus result in a more nearly free flowing product.

Electric power, generated in the factory power plant, will be transmitted at 4160 volts to 3 points near the centers of load. At these points, it will be transformed down to 480 volts for use by 70 electric motors. Extensive use of fluorescent lighting will be made. This will save power and improve appearance.

About 1,620,000 cu. ft. per day of natural gas or equivalent fuel oil will be required to furnish heat for the 2 direct fired driers.

All equipment is new and includes 6 pulp presses, 2 direct fired pulp driers, a generous supply of packaging machinery and many conveyors in the form of scrolls, belts and a large air conveying system. Buildings include 2 structures to house the driers, a packing station building and a large bulk pulp warehouse, 180 feet long by 170 feet wide by 100 feet high.

One of the more interesting features of the installation is the air conveying system, which will convey molasses dried beet pulp from the drier to the warehouse, a total distance of about 710 feet, by means of a high velocity stream of air thru a 10 inch diameter pipe. A 150 H.P. motor is required to drive the blower, which creates the high velocity air stream. Molasses dried beet pulp will be stored in bulk in the large warehouse, which will hold over 8,000 tons of dried pulp.

Pelletizing equipment will be installed to pelletize dried pulp into ⅜" diameter pellets. In the Rocky Mountain States, pulp pellets have become very popular in the feeding of sheep and cattle because of the ease with which they can be stored and handled. Pellets occupy less than ⅓ as much volume or space as does molasses dried beet pulp.

Facilities will be available at the Woodland Factory for shipping both molasses dried beet pulp and beet pulp pellets in sacks and in bulk. Sacked molasses dried beet pulp, beet pulp pellets and the bulk product can all be shipped via truck or rail. First production of molasses dried beet pulp is expected in October.

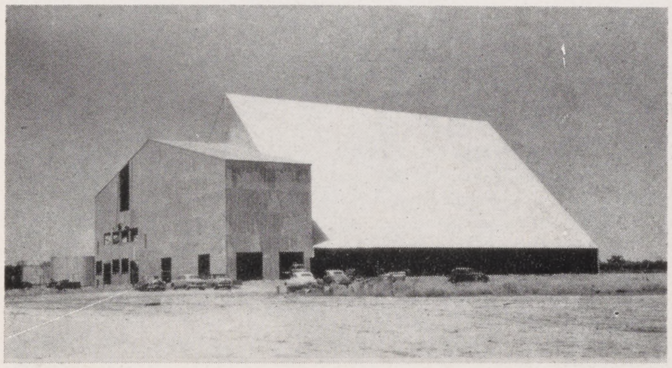

Photo by Fred Eis 65

BULK PULP warehouse building on right. Packing station building on left. The peak of the warehouse is 100 feet above ground.

SUGAR BEET FIELD DAY ON DAVIS CAMPUS

By F. J. HILLS

Extension Agronomist, University of California

AUGUST 8, 1952 saw approximately 250 growers, processors and research men attending the first Sugar Beet Field Day to be held on the Davis Campus of the University of California.

The morning program was held in the field. Nitrogen fertilization and the use of a growth regulator, maleic hydrazide, were the principle topics. Dr. David Ririe of the Agronomy Department has experiments in progress on both of thes subjects. The problem of nitrogen fertilization, one common to the majority of California sugar beet farmers, is being approached through the use of petiole (leaf stalk) analysis. Dr. Ulrich of the Department of Plant Nutrition has developed petiole analysis to the point where it can be used to practical advantage.

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DR. DAVID RIRIE points to a plot which has been properly fertilized.

Dr. Ririe's experiment is designed to show how the technique can be used to improve nitrogen fertilization of sugar beets to obtain the maximum production of sugar per acre.

Continued on page 38

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ACCOMPLISHMENTS of the experiment stations sugar beet program were explained by voice and chart.

SALT AND ALKALI TOLERANCE OF FIELD AND FORAGE CROPS

By L. D. DONEEN*

PLANT GROWTH is determined in part by the concentration and toxicity of the salts dissolved in the soil solution. These salts may have been originally in the soil, or accumulated there from the salts in the irrigation water. The tolerance of different crop plants varies over a surprisingly wide range of salt concentration, some crops thriving in an environment which would be fatal to other crops. A number of other factors may influence the salt tolerance of plants, such as climate, soil type, planting date, irrigation practice, and varietal differences and types of salt involved.

Irrigation Water As a Source of Salts

Well water, or underground water, contains minerals in varying proportions, depending upon the type of material through which the water percolates. The valleys of California are usually made up of a deep alluvial fill with stratifications of sands, gravel and boulders between layers of soil varying in porosity and thickness. The water-bearing materials are generally the course sand and gravel strata. The water may enter this water-bearing material from the surrounding mountains, from stream or river channels, and by means of deep percolation of rain, irrigation or flood waters from the valley floor. As the water slowly flows or percolates through these various strata, it dissolves minerals from the rock and soil in varying quantities. If the minerals dissolved are in the form of calcium and magnesium salts the water is known as "hard water", and common soaps do not form suds readily in it. This type of water is usually considered good for irrigation purposes, as only occasionally do the calcium and magnesium salts reach a concentration toxic to plant growth. On the other hand, "soft water" may come from either of two sources: (1) rain water that contains very few minerals, which will usually include runoff waters from melting snows or excessive rains, which have not had sufficient contact with the soil or rocks to dissolve appreciable quantities of minerals or (2) water containing a high percentage of sodium salts, such as certain well waters. These salts may reach a concentration toxic to plants, but even at low concentrations they cause a deterioration of the soil structure, and with their continued use the surface soil will seal and prevent the wetting of deeper layers. When sodium salts in the form of chloride (common salt) and sulfates (glauber salts) accumulate in excessive amounts in the soil they are known as white alkali. Some leaching of the surface soil should be provided, either by rainfall or excess irrigation to remove the excess soluble salts.

Most well waters contain appreciable quantities of salts. An estimate of the salt content in parts per million, or tons per acre-foot of water derived from conductance measurements (millimhos per Cm. Cube) is given in Table 1.

TABLE 1. SALT CONTENT OF IRRIGATION WATERS

Water Class	Conductance (Millimhos per Cm. Cube)	Salt Content: Total P.P.M.	Salt Content: TONS Per acre-ft. of water
Class 1 (Excellent to Good)	1.0	700	1
Class 2 (Good to Injurious)	1.0 - 2.0	700 - 2,100	1 - 3
Class 3 (Injurious to Unsatisfactory)	3.0	2,100	3

A water may be in Class 1 and still contain approximately a ton of salts per acre-foot of water. If 3 acre-feet are used per season, about 3 tons of salt will be added to the soil. Many of the well waters of the State have a conductance in the neighborhood of .5 to 1.0. This is equal to about ½ to 1 ton of salt per acre-foot of water.

Plant Tolerance to White Alkali Salts

The plants listed in Table 2 are divided into 3 major groups according to their salt tolerance. Separate listing are made for 2 crop divisions—field and truck crops, and forage crops. In each of these divisions the more tolerant plants are listed

TABLE 2—SALT TOLERANCE is maximum for crops at top of columns, progressively diminishing down the columns.

Electrical Conductivity of Saturated Soil Extract — Micromhos Per Cm. Cube	Forage Crops	Field and Truck Crops
20	SALT CONCENTRATION FATAL TO ALL CROPS	
18	Alkali sacaton	Sugar beets
	Salt grass	Table beets
	Nuttall alkali grass	Milo
	Bermuda grass	Kale
16	Rhodes grass	Barley
	Rescue grass	Alfalfa
	Canada Wild Rye	Flax
	Beardless Wild Rye	Tomato
14	Western Wheat grass	Asparagus
	Sweet Clover	Foxtail Millet
	Birdsfoot trefoil	Sorghum
12	Strawberry Clover	Cotton
	Dallis grass	Rye
	Sudan grass	Oats
	Hubam Clover	Rice
10	Alfalfa	Cantaloupe
	Tall fescue	Lettuce
	Orchard grass	Sunflower
	Blue grass	Carrot
8	Meadow fescue	Spinach
	Reed canary	Squash
	Big trefoil	Onion
	Smooth Brome	Pepper
6	Tall Meadow Oat Grass	Wheat
	Cicer Milk Vetch	Vetch
	Sour Clover	Peas
	Sickle Milk Vetch	Celery
4	White Dutch Clover	Cabbage
	Meadow foxtail	Artichoke
	Alsike Clover	Eggplant
2	Red Clover	Sweet potato
	Ladino Clover	Potato
	Burnet	Green beans
0	SALT CONCENTRATION FAVORABLE TO ALL CROPS	

* Associate Irrigation Agronomist, Division of Irrigation, University of Californ.a, Davis. This article is condensation of a mimeographed bulletin, "Quality of Water and Plant Tolerance to Salts," by the same author, and available on request from the University.

at the top of each column with decreasing salt tolerance progressively down the column. The plants listed in Table 2 are provisional and subject to revision, as additional information is obtained.

Tolerance to black alkali (sodium carbonate) is not considered in Table 2 as this salt has a high toxic and corrosive action on plants, as well as a serious compacting and sealing action on the soil.

As a measure of tolerance, it is asumed that fair to good yield will be obtained under favorable conditions of climate, soil and fertilizer.

SUGAR BEETS GROW ON ALKALI LAND

By N. K. GROEFSEMA,

Field Superintendent, Spreckels Sugar Company

WHITE ALKALI land that will take water will grow sugar beets. Proof of this simple, positive statement is offered by the experiences of growers for Spreckels Sugar Company on undeveloped lands in Kern County.

To grow any crop on white alkali land that will take water, getting a stand is the basic requirement. The crop must be planted in the winter time, when rains leach the salts down, and the weather is so cool that the alkali salts do not burn the tender seedlings.

Sugar beets lend themselves very well to December 15—January 15 planting in the South San Joaquin Valley. The winter rains which keep the salts leached down and germinate the seed give the crop its start. The fact that sugar beets are highly tolerant to salt aids a great deal in germination, emergence and growth throughout the season. Less salt-tolerant plants would be "burned" by the adverse minerals in hot weather, even if their seed had germinated.

Some of the actual details of farming practices, and illustrations of what sugar beets will do on alkali land in the Arvin area are revealed by the experiences of two growers.

J. Howard Porter grew a 14 ton beet crop on newly developed alkali land 5 miles west of Arvin in 1951. He planted a second beet crop in 1952 using 3 tons of manure and pre-fertilizing with 55 pounds of 15-8-4. He planted December 26-29, and rain fell on December 30. The beets were all up by January 20, despite the cold weather. After thinning he applied 250 pounds of ammonium sulfate. He commenced irrigating on about the first of July, and put about 30 pounds of nitrogen in the water. That 60 acre field yielded 17.79 tons per acre.

Glen Moody and Frank Walker landplaned 48 acres of undeveloped white alkali land 8 miles west of Arvin. They chiseled, disked, listed and were ready for planting by December 29, 1951. They planted their beets right after a rain on January 5, 1952. They rounded the beds off so that the two rows were planted lower than the center of the bed. Thus the alkali accumulated at the bed center, away from actual beet rows.

After thinning to 156 beets per 100 feet of row, they side dressed with 250 pounds of ammonium sulfate, and on September 6 completed the harvest of 18.70 tons of beets per acre with 16.70% sugar.

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THE ALKALI FLAT on the left became the high-yielding beet field on the right. This splendid example of land development was accomplished by Glen Moody and Frank Walker near Arvin.

Developing White Alkali Lands

Following is an outline of field operations and dates which have proved sucessful:

(1) LAND PREPARATION — October and November
- (a) Deep chisel or subsoil to insure water penetration.
- (b) Apply 2 to 3 tons of manure, prior to disking and listing.
- (c) List the beds before wet weather. Beds should be left rounded on top.
- (d) Pre-fertilize with at least 75 pounds of Nitrogen. This is necessary for vigorous seedling growth in cool weather. Ammonium Nitrate is recommended.

(3) PLANTING — December 15-January 20
- (a) Plant on sloping shoulders of rounded beds.
- (b) Seed should be planted as shallow as moisture conditions permit.
- (c) Later planting is satisfactory, but depends on subsequent rain. (Normal heavy "germination" rainfall is January 10-25 in the San Joaquin Valley.)

(4) THINNING — March 5-15

Plants should be thinned with a 4 inch hoe to 6 inches apart on double-row beds, and with a 3 inch hoe 4 to 5 inches apart in the case of single row beds. Thinning should be done when plants are large enough for thinners to differentiate between doubles and singles.

(5) FERTILIZING

Fertilizer should be side dressed immediately after thinning. Material to be used is optional, since the weather is warm enough for conversion of Ammoniacal Nitrogen to nitrate nitrogen.

(5) WEEDING — Early and often
- (a) Water grass or Johnson grass should not be allowed to get a start.
- (b) Continue cultivation, even though the beets are large enough to cover the rows.

FIELD DAY

Continued from page 35

Maleic hydrazide is a chemical which when sprayed on sugar beet leaves shortly before harvest can slow the growth of the plant and thereby enable the beet to store more sugar, increasing the sugar percentage, rather than using the sugar for additional growth. The experiments at Davis will increase our knowledge about the use of this material and will aid in learning when and how maleic hydrazide might be used effectively.

Dr. F. N. Briggs, then Chairman of the Agronomy Department and now Dean of the College of Agriculture at Davis, presided as Master of Ceremonies for the afternoon program held in Hunt Hall.

J. Earl Coke, Director of Agriculture Extension and an old friend of the sugar beet industry, addressed the group. Director Coke spoke of sugar beet research in the University. He pointed out that the complexities of sugar beet production problems require an overall University approach and cooperation by many specialists.

Dr. D. J. Raski, nematolgist, University of California, discussed the sugar beet nematode situation. Dr. Raski stressed that even though chemical control measures have not proven too effective, growers can raise good crops of sugar beets on mentaode infested fields if proper crop rotations are followed.

A round table discussion on the virus yellow disease of sugar beets was of great interest to the audience as evidenced by many questions from the floor. Since the recent identification of this disease in California beet fields by Dr. G. H. Coons of the U. S. Department of Agriculture, there has been much speculation and concern on the part of the industry as to its probable effect on sugar beet production. The round table was made up of research workers in California who have been investigating this problem. Dr. L. D. Leach, plant pathologist University of California, served as moderator for the round table and introduced the topic by reviewing the history of the disease in Europe and the earlier attempts at transmission from sugar beets in California.

Dr. C. W. Bennett, plant pathologist, U. S. Department of Agriculture at Riverside, and Dr. J. S. McFarlane, geneticist, U. S. Department of Agriculture at Salinas, told of their studies concerning the host range of this virus; investigations to find sugar beets more tolerant to the virus; and experiments designed to determine the effect of the disease on sugar production.

Dr. E. S. Sylvester, entomologist, University of California, discussed the insect carriers of the virus and related what is known concerning the peak population periods of the green peach aphid in California. This aphid is the major carrier of the virus.

It is hoped that such a sugar beet field day can become an annual affair and will serve as an opportunity for all interested in sugar beet culture to get together, see and hear current research developments, and to discuss problems of common interest.

VIRUS YELLOWS STUDIES DISCUSSED BY SPECIALISTS

THE PROGRAM of Sugar Beet Field Day held August 8, 1952, at the University of California in Davis included a round table discussion of a sugar beet disease, virus yellows, which has been known for several years in Europe but which has not until this year been positively identified in California.

At this time the presence of the disease in California has been established. However, whether or not the disease causes any reduction in yield or sugar content has not been determined.

DR. L. D. LEACH, Plant Pathologist of the University of California, opened the meeting with a discussion of virus yellows in Europe and in California. We quote Dr. Leach:

"A mild strain of virus yellows is now known to be present in California sugar beets. But before one can properly evaluate its importance to beet culture in California it is imperative to learn how much of the yellowing observed in California is caused by virus yellows infection and to determine the effect of the strains of virus present in California upon the yield of sugar beets.

"For several years a yellowing of sugar beets, particularly in the coastal areas of California, has been under observation and investigation. Certain types of yellowing are known to be caused by nitrogen deficiency, downy mildew, leaf miners or by virus infections such as mosaic, yellow net or curly top. Other types of yellowing were not identified but resembled the virus yellows of Europe.

"Until 1951 all attempts at transmission yielded negative results and suspected roots air mailed to Holland were pronounced free of infection. In September 1951 Dr. Raymond Hull of the Rothamsted Experiment Station, England, observed sugar beet fields in several areas of California and concluded that the symptoms were indistinguishable from those of virus yellows.

"Early in 1952 Dr. G. H. Coons, U. S. Department of Agriculture, reported from serological and transmissions trials that virus yellows is present in California. His results were later confirmed by Dr. Hull.

"Infected plant are characterized by yellowing of the outer leaves and by a thickening and brittleness of the leaf tissus. In Europe strains of the virus ranging from mild to severe are recognized. These differ in symptom expression as well as in effect on productivity.

"Control of virus yellows in Europe centers primarily around elimination of overwintering sources of the virus but other measures such as direct control of the insect vectors and development of tolerant or resistant varieties are also under investigation."

DR. C. W. BENNETT, Principal Plant Pathologist, Sugar Plant Investigations, U. S. Department of Agriculture, reported on his studies on sugar beet virus yellows at Riverside.

"Studies on sugar beet virus yellows at Riverside, California during the latter part of 1951 and the

first half of 1952 have consisted chiefly of routine identification tests with sugar beets from different areas suspected to be infected with yellows, and intensive inoculation tests to gain information on varietal susceptibility and on host range of the disease.

"Preliminary tests in the greenhouse indicate that there may be an appreciable range of susceptibility to infection and to injury among sugar beet varieties and selections. The greenhouse results, however, must be confirmed by field tests.

"The importance of the various susceptible species and varieties of plants, other than sugar beet, in the perpetuation and spread of virus yellows remains to be determined. It seems probable that in most, if not all areas, wild and escaped beets and beets that remain unharvested in the field through the winter will be found to be important sources of spring infection."

An interesting discussion on the part played by aphids in connection with the spread of virus yellows was presented by DR. E. S. SYLVESTER, Assistant Entomologist, University of California.

"Rather extensive research work by the English workers on the vector-virus relationships between virus yellows and the green peach aphid have revealed the following facts: The insects are capable of acquiring a virus charge in approximately 5 minutes of feeding on a diseased plant, and they can inoculate a healthy plant in a similarly short time. However, infectivity of the aphids increases as the feeding time on the diseased plant increases, and the longer the insects on a healthy plant the more likely is that plant to be infected. Aphids retain the virus for a limited time, approximately 3 days. There is no clearly defined latent period found in the vector. Consequently, it can be said that while a number of plants can be infected by a single infective insect, the probability of infection decreses with the length of feeding on healthy plants.

John Black Photo 70

CONTRIBUTORS to the virus yellows round table discussion were (left to right) Dr. E. S. Sylvester, Dr. C. W. Bennett, Dr. J. S. McFarland, and Dr. L. D. Leach.

"The largest and most persistent source of infection for the root crops of sugar beets are the sugar beet and mangold seed crops. In England green peach aphids enter the beet fields before black bean aphids and therefore the green peach aphids are responsible for the early infections. It is the early infections which cause the most loss. Application of insecticides on seed and root crops has failed to control the virus adequately.

"The time of planting is an important factor. In England, where the peak aphid populations occur in June, the recommendations are for early planting (April), since the early planted crops yield better than late sown crops, and this increase in yield is maintained if both become infected. The aim of the cultural practices is to obtain as much vigorous growth as possible before aphid infestation and consequent infection occurs.

"In California work has been done on aphid-borne virus disease both on potatoes and on sugar beets. The aphid chiefly concerned was the green peach aphid. Trials were made in two localities in Kern County and one locality in the San Francisco Bay area. In all localities and in all years during which records were kept, the green peach aphid populations reached their peaks during April and then rapidly declined during May. On beets the largest populations were found on young beets just prior to thinning or shortly thereafter. However, it should be remembered that aphid populations are extremely local in character, and consequently with the data at hand no large generalizations are justified."

Of particular interest to beet growers in the Salinas Valley was the presentation by J. S. MCFARLANE, Geneticist, Sugar Plant Investigations, U. S. Department of Agriculture.

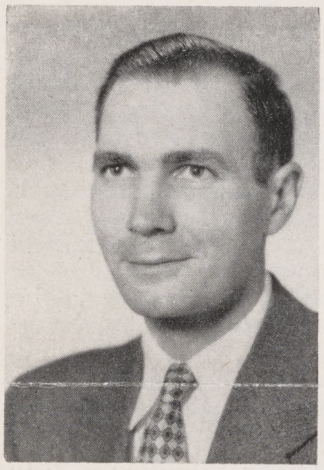
"During the current growing season, the virus yellows disease of sugar beets has been under close observation in the Salinas Valley. A general yellowing identified as virus yellows first appeared in early-planted commercial fields in late May and early June. Little evidence of infection centers has been observed in these early-planted fields which indicates that the heavy flights of winged aphis which migrate to the fields in April and May are carrying the yellows virus. As the disease developed, the foilage has taken on an intense yellow color and the lower leaves have gradually become necrotic. Many of the yellowed fields are framed by green borders. Yellowed fields in which good cultural and fertilizer practices are used have shown little evidence of reduced vigor. Early-infected fields began showing recovery characterized by new green growth during July.

"At present, no information is available on the effect of virus yellows on yield and sugar content in California. Two replicated experiments are now in progress at Salinas in an attempt to measure these effects. Systox spray and Malathon dust are being used to control the aphis which spread virus yellows.

"None of our present varieties has been found resistant to virus yellows. However, slight differences have been observed among varieties and breeding stocks in the intensity of the yellowing. Under field conditions, the US 15 variety begins to yellow earlier and shows more intense yellowing than do the other commercial varieties used in

Continued on next page

AGRONOMIST JOINS SPRECKELS AGRICULTURAL STAFF



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SPRECKELS SUGAR Company is happy to announce that Mr. Lauren Burtch will serve the Agricultural Department in the Central Valley area as an assistant to Dr. Russell Johnson in the Company's expanded Plant Breeding and Experimental Program.

Mr. Burtch brings to the Spreckels Sugar Company a rich background of experience in agronomic research. He graduated from Washington and Jefferson College with a Bachelor's Degree in chemistry in 1944. He received his Master's Degree in soil science at Utah State Agricultural College in 1948, and continued his graduate studies at Rutgers University in 1950.

Along with all of this academic training was two years of service in the U. S. Navy.

His practical background has included two years as instructor in the Chemistry and Soils Departments of Utah State College, and three years as Associate Argonomist with the U. S.D. A. Natural Rubber Research Station.

VIRUS YELLOWS

Continued from page 39

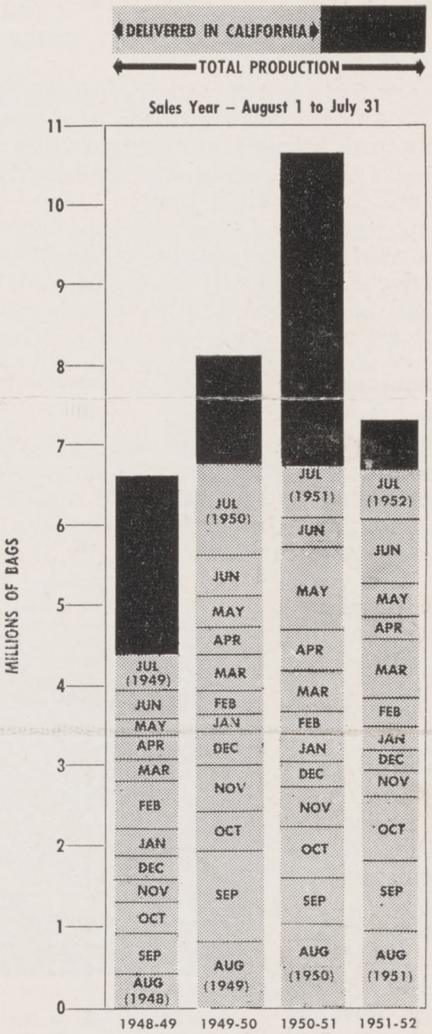
California. A bolting-resistant inbred designated NB1 has shown the least yellowing of the breeding stocks tested at Salinas."

MR. F. J. HILLS, Extension Agronomist, University of California has closely followed the research work on virus yellows. He comments on the round table discussion with this summary:

"Some of the main points brought out by the discussion were:

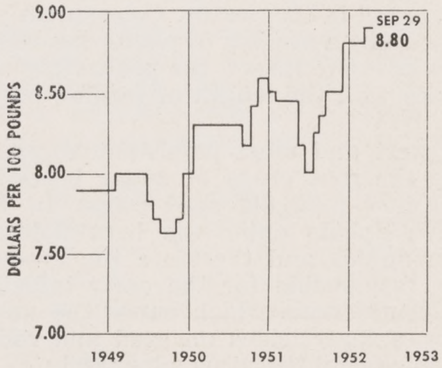
1. Virus yellows is present in some California beets fields.
2. The strain of the virus isolated so far is apparently a mild one and is not as destructive as some of the strains occurring in Europe.
3. At present it is not clear how much of the yellowing occurring in beet fields is due to the virus yellows disease.
4. One of the first problems is to determine the extent of the occurrance of this disease in California beet fields, and what effect, if any, it has on the yield of sugar beets."

PRODUCTION AND DELIVERIES OF BEET SUGAR IN CALIFORNIA



QUOTED PRICE OF BEET GRANULATED SUGAR

In 100 Lb. Paper Bags, F.O.B. San Francisco



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The SPRECKELS SUGAR BEET BULLETIN is issued bi-monthly by the Agricultural Department of the Spreckels Sugar Company as a service to its growers.
Mention of specific methods, devices or implements does not constitute an endorsement by the Company.
All photographs by the editor unless otherwise indicated.
AUSTIN ARMER, Editor 600 California Fruit Building Sacramento, California

SPRECKELS SUGAR BEET BULLETIN

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GET READY TO PLANT BEETS

Early planting can mean early harvest—with maximum sugar per acre.

LAND PREPARATION

RIDGE FORMING

PRE-FERTILIZING

should be completed in early winter. See pages 42-43-44

Vol. 16 NOVEMBER - DECEMBER, 1952 No. 6
PUBLISHED FOR CALIFORNIA SUGAR BEET GROWERS BY THE SPRECKELS SUGAR COMPANY

PLANT SUGAR BEETS EARLY

By JOHN McDOUGALL

Field Superintendent, Spreckels Sugar Company

THE ADVANTAGES of early planting of sugar beets have often been discussed (SPRECKELS SUGAR BEET BULLETIN, Volume XV, 1951, Page 48). These advantages include a maximum growing season, a more leisurely approach to the spring labor problem, and maximum yields of sugar per acre. It is the purpose of this article to stress some of the problems of early planting and to suggest some solutions.

LAND PREPARATION

Soil type is an important factor in relation to early planting. Sandy soils are particularly satisfactory because they are easily worked, and are not adversely affected by fall rains.

Heavy soils, on the other hand, lend themselves readily to early planting if properly managed. The heavy tractor work such as plowing or chiseling must be done in the fall, and if ridge planting is contemplated, the ridges should be listed before the rainy season. In some cases, such as land preparation following a barley crop, or where water grass has been a problem, one or two early pre-irrigations can be of great value. They not only make the soil more workable, but help in sprouting volunteer barley or water grass so that it can be destroyed.

Subsoiling and deep chiseling are essential preliminaries to the preparation of a seed bed in heavy soils, in order to assure water penetration and good root growth. The very nature of deep cultivation with its resulting clods means doing the job before the rainy season so that the clods will be broken down by the first rains.

SEED BED PREPARATION

When the first break in the weather arrives—usually in December—the listed ridges can be worked up into seed beds, because they will have drained well and will be ready for working considerably sooner than the same field prepared for flat planting. A drag harrow or bed shaper will put these high, rough ridges in good shape for planting. If there has been a considerable growth of winter weeds it may be desirable to split the beds with a second listing operation, although this is one situation where chemical weed killers have proved satisfactory.

Planting can be done during one of the dry spells which, although short, are relatively frequent throughout the winter season and in California's Central Valley areas. The best practice is to plant directly after the seed bed preparation. For this reason it is evident that the best practice is to prepare a relatively small field at any one time and not to attempt the planting of a very large acreage all at once.

The combination lister-bed shaper-planters, now popular with many Sacramento Valley growers, are particularly suitable for taking advantage of short breaks in the weather.

FERTILIZING

During the cold months of the year the activity of soil organisms is retarded, so that the early application of nitrogen fertilizers is advisable. An initial application of about 80 units is generally used, and the second application after thinning can be judged by the crop history of the field. (This subject is covered in detail in the article in this issue entitled "Are Your Beets Well Fertilized?")

PLANTING

The technique of planting beet seed during the winter is influenced strongly by the crust problem, which is particularly serious throughout the Sacramento Valley. If a grower plants his seed deep in order to be sure of reaching sufficient moisture for germination, he is almost certain to encounter a heavy rain and drying wind soon after planting. Thus the advantage of planting deep to insure germination is far outweighed by the probable damage to small seedlings when they attempt to force their way through a thick layer of soil which is getting progressively tougher and finally presents an inpenetrable crust at the surface. Thus in an early planting program it is far safer to plant shallow with the expectation of germination from rainfall, rather than to plant deep enough to reach soil moisture. (This is by no means a general recommendation, but refers only to early planting.) However, shallow planting also has its advantages later in the season, when germination by irrigation is contemplated.

If a crust condition does develop before even the shallow-planted seeds have emerged, rolling will become necessary, although it is not particularly desirable, especially on flat planting. There is a tendency for the crust directly over the seed row to be unaffected, since the planter's packer wheels have left a groove which is out of reach of the roller. Crust breaking by rolling is much more effective on bed planted beets.

The choice of seed variety for early planting should in general be made in close collaboration with the field superintendent. However, the vigorous nonbolting varieties such as US15, US56 or the newly developed S2 are generally recommended.

ADVANTAGES OF EARLY PLANTING

If a long growing season is to be a certainty, the early weeks are the important ones because the end of the growing season is fixed by the sheer necessity of harvesting the crop before the rainy season sets in.

The inconveniences of a regulated harvest can be very much relieved if a large percentage of growers plant early, with a view toward early harvest. Proper attention to the fertilizer problem can bring the sugar yield to its maximum early in the harvest season.

Spring labor is far more available in March and April than a month later, so that early beets can benefit from thinning at just the right time.

The weed problem—especially water grass—is greatly relieved if the beet foliage has had time to cover and shade the rows before temperatures rise to the point where water grass germinates.

These are just some of the advantages—individual growers will find others if they will consider early planting in relation to their particular conditions.

PLANTING TRENDS SHOWN BY GROWER-BUILT MACHINES

By AUSTIN ARMER

Agricultural Engineer, Spreckels Sugar Company

A GOOD IDEA does not always catch on right away—perhaps that is why Bert Fiske's rotary tiller-lister-bed shaper-planter remained the only one of its kind for a year after he built it in 1948. Then another Woodland sugar beet grower, Fred Tadlock, started a chain reaction by building a sled which carried lister shovels, rototillers, fertilizer applicators, bed rollers and planters.

Now there are, within the knowledge of this author, nine such machines in use, designed or built by the following Spreckels growers:

Bert Fiske	Schneider, Frick & Schneider
Fred Tadlock (2)	Meek & Le Maitre
Oliver Orrick	Robert L. Button
Wilson Lovvorn	Wetzel Brothers

This imposing list surely indicates that there must be some advantages to the "Once-Over" system.

The appeal for any "Once Over" system is strong, because of the obvious saving in tractor and operator hours. But most efforts to combine operations have tended toward reduced quality of work in the individual jobs—and the net result was a loss in overall efficiency. Now, however, there can be demonstrated several improvements in quality of work, together with some real cultural advantages. These are:

1—Rows are straighter, because of the long sled-runners used.

2—Regardless of row-straightness, the row centers always follow the bed center exactly.

3—Adequate and uniform shoulders are retained on the beds.

4—Adjacent beds are level and of equal height, favoring good cultivation and irrigation.

5—Seed is planted into a well-tilled and pre-fertilized bed.

6—Early planting is favored because a short dry spell permits completion of all operations in a very few days.

7—Late planting, or planting for spring harvest by irrigating for germination is equally favored by the same machine.

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THE MACHINE used by Schneider, Fricke and Schneider is the most complete—even to its own power unit.

ASSISTANT DISTRICT MANAGERS EXCHANGE HEADQUARTERS

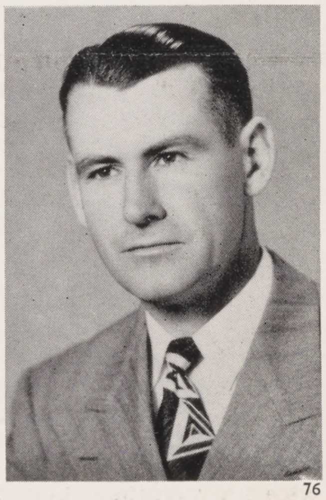
GUY D. MANUEL, Vice President and General Agriculturist, has announced the following personnel changes in the Agricultural Department:

Ralph S. Lambdin, who has been assistant District Manager at Salinas since 1946, is being transferred to Sacramento to take over the same position in the Sacramento-San Joaquin District Office.

Harry J. Venning, who has been assistant District Manager in Sacramento since 1948, will go to Salinas as assistant District Manager for the Salinas Valley District.

McCurry Photo 75

HARRY J. VENNING
To Spreckels



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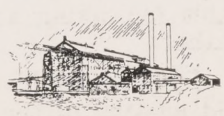
RALPH S. LAMBDIN
To Sacramento

This change will offer both men an opportunity to become acquainted with the problems confronting beet growers in all of the Districts in which the company operates. It will also mean an exchange of experiences and new ideas throughout the entire agricultural organization of the Company, which will be of value to both fieldmen and growers.

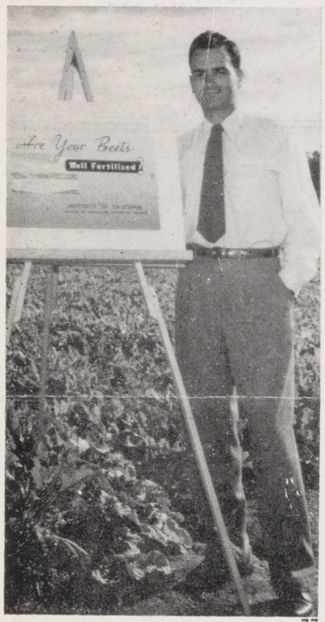
Mr. Lambdin came to Spreckels from the University of California at Davis in 1938 and was Field Superintendent until 1942 when he was appointed Assistant Agricultural Superintendent. He became Assistant District Manager in 1946.

Mr. Venning graduated from the University of California in 1939; started as Assistant Field Superintendent at Woodland; became field Superintendent at Woodland, and later at Grimes. In 1946 he was appointed Agricultural Superintendent at Woodland, and in 1948 assumed the duties of Assistant District Manager at Sacramento.



ARE YOUR BEETS WELL FERTILIZED?

F. J. HILLS, ALBERT ULRICH AND DAVID RIRIE*



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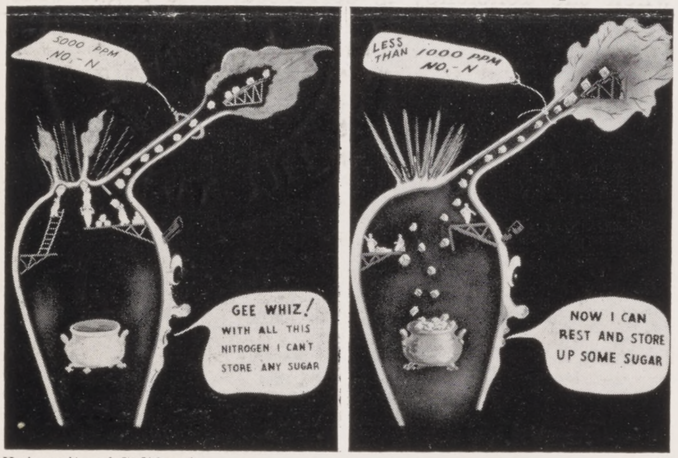
PERHAPS the first question to be answered is: "What is a well fertilized beet?" A field of sugar beets can be considered well fed or "well fertilized" if throughout its growing season it has been able to obtain all the inorganic elements necessary to produce the maximum amount of sugar possible. Some crops are well fed without receiving an ounce of commercial or organic fertilizer simply because they are growing on fields of high native fertility and do not require additional amounts of plant nutrients.

Unfortunately, there are few fields in California that can be "fertilized" with so little effort. Most of our beet crops require additional amounts of certain plant nutrients to produce maximum tonnages. Generally, the nutrient that is in deficient supply is nitrogen. In some areas of the state, notably the Sacramento-San Joaquin delta, phosphate is frequently the nutrient lacking. Rarely a field of beets is found where the plants will respond to potassium.

So the problem of sugar beet fertilization in our state appears, on the surface, to be relatively simple; generally, we just add nitrogen. There are, however, some things about nitrogen, its effects on the sugar beet and its availability in different soils, that turn this relatively simple situation into a complex one.

THE NITROGEN PROBLEM

Large amounts of nitrogen available to plants at harvest have little effect on the production of most of our truck and field crops. Not so with the sugar beet, however. High nitrogen at harvest means a lower sugar concentration. The principle reason for this appears to be that continued vegetative growth, promoted by high levels of nitrogen, utilizes a good deal of the sugar which would otherwise be stored in the root. A further effect of an over supply of nitrogen is a beet which is undesirable from the processing point of view. It is more difficult to extract sugar from such beets. Fertilizing sugar beets, therefore, is not a matter of merely providing plenty of nitrogen to promote maximum growth, which might, at the worst, waste some fertilizer. The nitrogen supply should be so regulated that it will be depleted prior to harvest.



University of California

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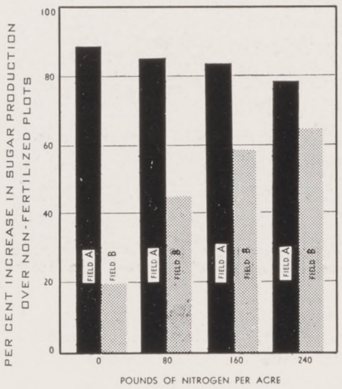
HIGH NITROGEN at harvest means continued use of sugar manufactured in leaves for new top and root growth—the sugar bowl remains empty.

LOW NITROGEN at harvest means less demand for sugar for new growth and allows the sugar bowl to fill.

Each sugar beet crop, in a given season, requires a specific amount of nitrogen to produce a root yield and sugar concentration which will maximize the return to the grower. Unfortunately, there is no simple procedure for determining what this amount will be. There is ample evidence that, under our complex conditions, soil analyses will not yield this information. Fertilizer experiments show that, even within a small area, nitrogen requirements differ markedly from field to field; and further, that even a given field may respond quite differently in different seasons. From extensive fertilizer trials an "average" amount of nitrogen for maximum response can be calculated. Such an average, however, even in a restricted area, will be too low for many fields and too high for others.



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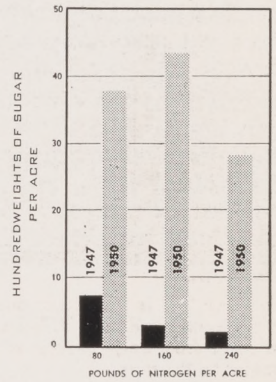
LEFT—the nitrogen requirement for sugar beets differs markedly from field to field. Nitrogen added to field A actually depressed yield, while the net dollar return continued to increase when 240 lbs. of N per acre were applied to field B.



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RIGHT—nitrogen requirements for the same field differ from year to year. Regardless of nitrogen rate, yields were better in 1950 than in 1947, in this field.

Any procedure which will enable us to fertilize beet fields more efficiently is well worth considering. Not only would individual farmers gain, but a more efficient use of our fertilizer supply is highly desirable. Using nitrogen in excess, or phosphate and potassium where they are not needed, would appear to be wasteful. Far better to use these materials when and where they will produce plant responses rather than to add them to soils where they are not needed. Fertilizers not needed for plant growth are often leached away by rains or irrigation water, locked up

and made unavailable to plants, or absorbed by plants in luxury amounts.

Plant analysis, or petiole analysis as it is called with reference to sugar beets, can help us do a better job of fertilizing. It works like this:

COLLECTING AND ANALYZING PETIOLE SAMPLES

It is easy to learn the proper leaf to take for your sample. Don't take a young center leaf, or an old outside one. Take one of the large leaves in between.

Albert Ulrich 81

LEAF "A" is the proper one to select for a petiole sample. (Leaf "B" is too young and leaf "C" is too old.) Thirty or forty petioles should be selected from each quarter of a field, while the sampler walks at right angles to the rows.

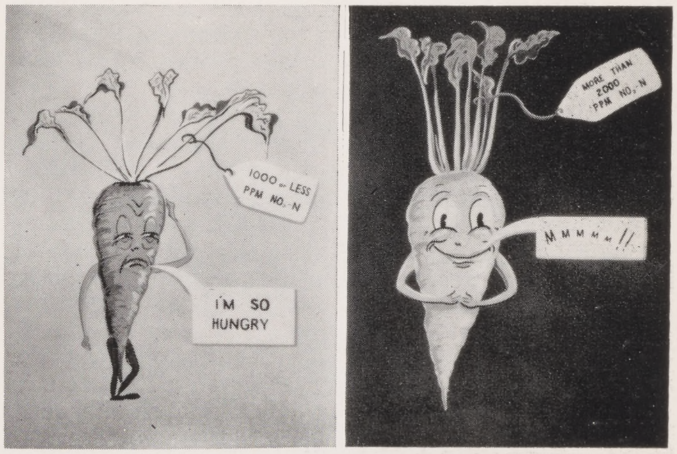
The leaf blade is discarded and only the leaf stalk (petiole) included in the sample. About 40 such petioles make up each sample. A typical field is sampled in the following manner. The field is divided into four approximately equal parts. If the field is larger than 40 acres, it should be divided into at least 6 or 8 parts so that each area sampled represents about 10 acres. The sampler walks straight across the field at right angles to the rows and takes one leaf per plant from 30 to 40 locations distributed at equal intervals across each section sampled. Thus, four samples, a, b, c, and d are collected from each field; more if the field is larger than 40 acres.

The samples are then taken to a laboratory equipped to make quantitative analyses, where each is cut up into about 1/8 inch sections. The pieces are thoroughly mixed together and one large handful placed in a smaller bag and put in an oven to dry.

The next day the samples are put through a grinding mill and ground into fine particles. Portions of each sample are weighed out for analysis. The samples can be analyzed for a number of plant nutrients but the ones we are usually most interested in are nitrate-nitrogen, phosphate-phosphorus and potassium.

WHAT THE ANALYSES TELL

The concentration of nitrate-nitrogen in these samples tells us whether the beets were getting enough nitrogen at the time the samples were taken.



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BEETS whose petioles test less than 1000 PPM of NO_3-N are suffering from nitrogen deficiency.

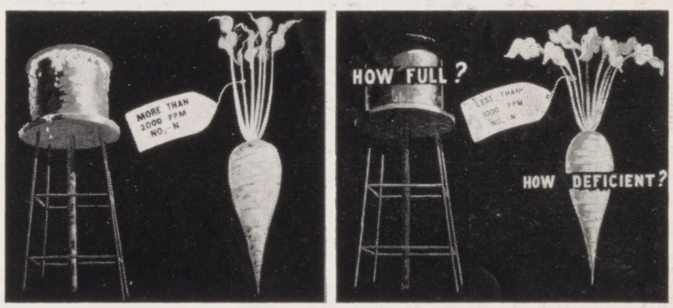
BEETS whose petioles contain more than 2000 PPM of NO_3-N are well supplied with nitrogen.

If the concentration was less than 1000 parts per million, we can be sure the nitrogen requirements of the plant are not satisfied. Concentrations appreciably greater than this indicate that the beets were getting all the nitrogen they needed at the time the samples were taken. Giving them more nitrogen will not make them grow faster.

Experience with critical levels of phosphate- phosphorus and potassium are not as extensive as with nitrogen. Enough data are available, however, to make petiole analysis valuable in determining how well a given crop has been supplied with these nutrients and whether there is a likelihood of obtaining a response by fertilizing with these materials.

WHAT THE ANALYSES DO NOT TELL

Plant analysis tells us this simple fact, whether or not the beets were getting enough nitrogen (or other nutrient) at the time the samples were taken. But it does not tell just how deficient the beets are; how much nitrogen it will take to correct the deficiency; or what magnitude of response will be obtained when the deficiency is corrected. The sugar beet may be compared to a water tower that does not have a float to indicate the water level. When water



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LIKE THE overflowing tank, the beet with nitrogen above the critical level can utilize no more.

LIKE THE part-full tank with no gauge, the beet with nitrogen below critical level does not reveal the extent of its deficiency.

spills over the top, you know the tank is full. Similarly, if the beet is above the critical range, you

Continued on next page

know it is getting enough nitrogen. If no water spills from the tank, how full is it? So with the beet that is below the critical range—you do not know how deficient it really is.

In some soils nitrates may be formed at a fairly rapid rate and supply the plants with the greater portion of their nitrogen requirements. Yet the concentration of nitrate-nitrogen in the petiole may be low and the beets deficient. The response obtained to additional nitrogen, in this case, would be small. In other soils, nitrate formation may be practically nil. More nitrogen added to such fields could produce a large response.

A response to fertilizer may be limited by other factors affecting beet growth such as a lack of sufficient soil-moisture, poor stands, diseases or weeds. Beets deficient in phosphorus and nitrogen will make little response to additional nitrogen unless the phosphorus deficiency is also corrected.

Thus, two fields with about the same number of days of nitrogen deficiency prior to harvest can differ greatly in their response to nitrogen and in the amount it takes to give maximum yields.

HOW TO USE PETIOLE ANALYSIS

Despite the things that petiole analysis cannot tell, it can be a valuable aid to more efficient sugar beet fertilization, particularly when local expeiience is gained in its use.

It can serve as an inventory to see how well a crop was supplied with phosphorus and potassium as well as nitrogen. Low phosphate or potassium values early in the season would indicate that these fertilizers should be tried in test strips with subsequent crops to see if they are needed. Conversely, high values would indicate that these nutrients were in plentiful supply and need not be added in fertilizers.

SOME CORRECTIONS

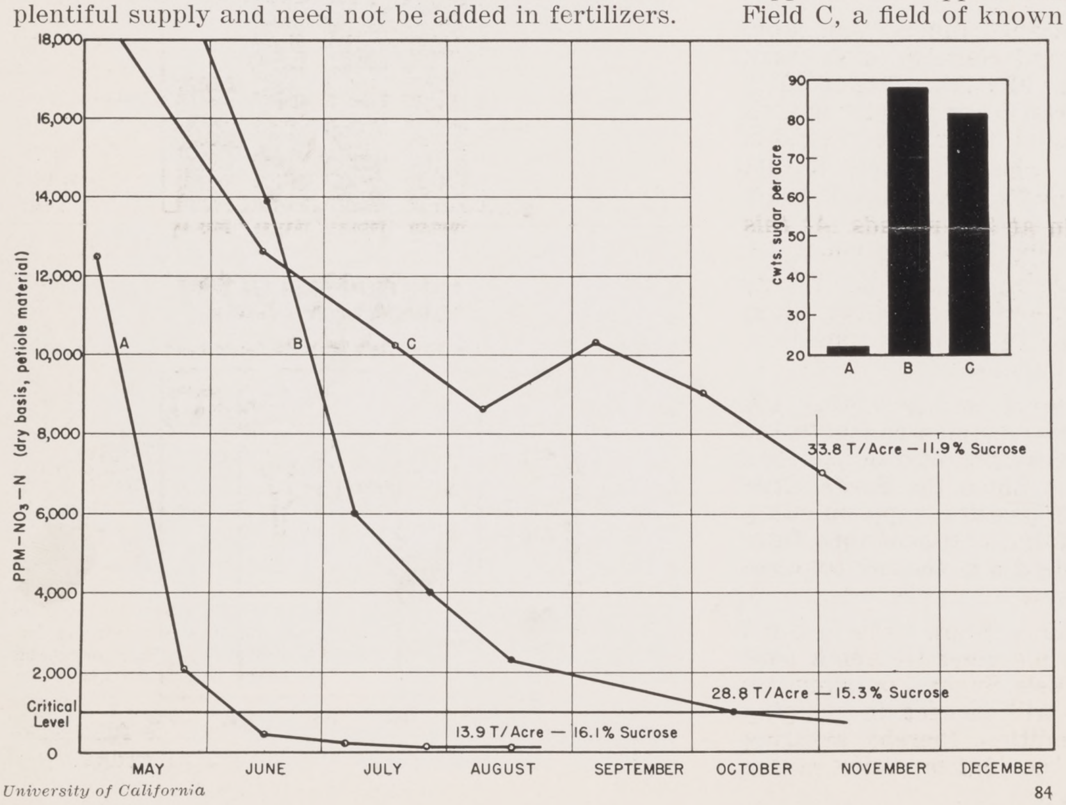
In the last issue of SPRECKELS SUGAR BEET BULLETIN, the article entitled "Sugar Beets Grow on Alkali Land" was compiled before some of the figures on yield and fertilizer rates had been verified. Now that the final returns are in, we offer the following corrected figures:

1. J. Howard Porter's yield was 19.93 tons per acre, not 17.79.
2. He applied 500 lbs. of 15-8-4, not 55 lbs.
3. He started irrigation about April 1.
4. Moody and Walker applied an additional 400 lbs. of Ammonium Sulfate.
5. Their final yield was 16.06 tons per acre.

More efficient nitrogen fertilization of the current season's crop might be achieved by fertilizing initially with somewhat less than the maximum amount one considers the field can use, say 80 pounds of nitrogen per acre. Then by taking samples at two or three-week intervals, especially during the late spring and early summer when the plants are growing rapidly, the nitrogen level in the beets can be followed and supplemental fertilizer added if an early deficiency is indicated. On fields of known high fertility, it would be well not to apply nitrogen at all until the plants indicate a need through petiole analyses.

The three fields represented by the curves below received about the same amount of nitrogen (about 100 lbs. per acre). Field A probably could have used a supplemental application about the first of June. Field C, a field of known high fertility, would probably have been better off if no nitrogen had been added. The very low sugar concentration in the beets from this field was undoubtedly due, to a large extent, to the high nitrogen level at harvest. Field B appears to have been well fertilized; no supplemental application is indicated for this field.

We can hardly expect any one technique or procedure to answer all questions connected with as complex a problem as suger beet fertilization. Nevertheless, plant analysis can help us to a job that would be a big improvement over our present method of guess, and guess again.



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*The authors are respectively: Extension Agronomist, Associate Physiologist, and Junior Agronomist, University of California.

SALINAS 4-H BOY WINS CALF HONORS

By JAMES E. GARDINER
Field Superintendent, Spreckels Sugar Company

EARLY THIS year at the Cow Palace Junior Livestock Show, Spreckels Sugar Company contributed to a fund, through which deserving 4-H and F.F.A. members could purchase livestock. The boy selected to receive Spreckels Sugar Company's sponsorship was to be the son of one of our own beet growers, and we believe we have picked a good one.

His name is Gerald Lanini from Salinas. Gerald lives with his parents, Mr. and Mrs. Frank Lanini, in the Blanco District near Salinas.

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GERALD LANINI and his steer.

With the help of Spreckels Sugar Company, Gerald purchased a 540 pound Hereford steer from the S. & S. ranch in Aptos at 32 cents a pound. The animals from the S. & S. ranch are noted for high quality and have always placed "prime" at the fairs.

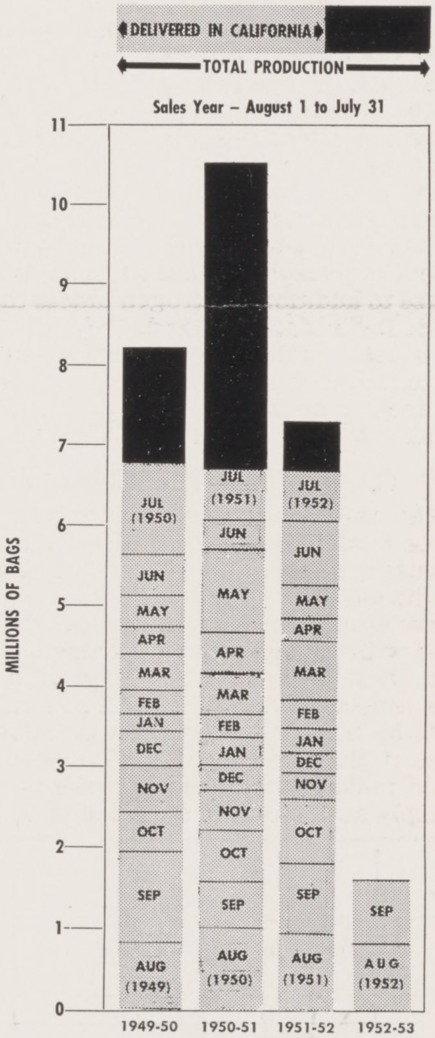
Shortly after the steer was purchased Gerald entered him in the Monterey County Fair, at which time the animal weighed in at 580 pounds. At this show the steer won the "second place" ribbon.

Late in September Gerald took the steer to the Santa Cruz County Fair where he received "first prize" in the Junior Feeder Division. At this time the steer weighed in at 780 pounds.

During the time that Gerald was grooming his animal for exhibition, he was feeding a concentrated diet of rolled barley, molasses dried beet pulp, rolled oats, and cotton-seed cake. Since the Santa Cruz Fair he has put the steer on pasture, supplementing the diet with beet pulp, alfalfa, and beet tops from his father's beet field. (I might add the net tonnage on this field was 29.7 per acre.)

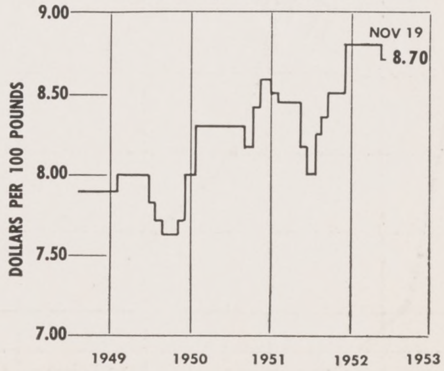
When the Junior Livestock Show rolls around next April, Gerald expects his steer to weigh over 1000 pounds. As for Spreckels Sugar Company, we feel confident that Gerald will succeed in bringing his feeder steer to top condition, thereby assuring himself a champion, and the highest price at the Cow Palace sale.

PRODUCTION AND DELIVERIES OF BEET SUGAR IN CALIFORNIA



QUOTED PRICE OF BEET GRANULATED SUGAR

In 100 Lb. Paper Bags, F.O.B. San Francisco



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Mention of specific methods, devices or implements does not constitute an endorsement by the Company.
All photographs by the editor unless otherwise indicated.
AUSTIN ARMER, Editor 600 California Fruit Building Sacramento, California